Enhanced Four Paradigms of Information Systems Development in Network Societies

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ABSTRACT

The main aim of this research has been to relate the theory of ISD discussed in Hirschheim’s and Klein’s article “Four Paradigms of Information Systems Development” (ISD) to Churchman’s theory of ISD discussed in his book “The Design of Inquiring Systems”. It has been important to relate those two assumptions of ISD in order to enhance both of them and to get a more explicit understanding of ISD. The main hypothesis in this research has been that it is possible to relate them to each other and to clarify and enhance them since they are both based on philosophical assumptions of knowledge generation i.e. epistemology. Epistemological and ontological aspects of knowledge generation and nature of societies are very important for understanding of IS since knowledge transfer is more and more common because of ICT development. The synthesis of those two well-known approaches to ISD is the main contribution of this research master thesis. The other contributions are the solution for double-loop learning through multi-agent system development and the solution for developing sustainable network societies through peer-to-peer networking combined with centralised networking functioning as a library. I also have given an explicit explanation of the differences between monism (holism) and pluralism, in this case regarding to Leibniz’s and Locke’s philosophical views. Singerian epistemology has been generated from his explanation of insufficiency of either rationalist or interpretative approaches for explanation of natural laws and this is also one of my contributions in this research. I also recommended a complementary use of the rationalist, empirical and interpretative research methodologies for research in theoretical, experimental, applied and social science fields. It has been also examined which methodologies are predominating at universities offering degrees in social informatics and it has appeared that on the most of universities offering degree in social informatics, proper research methodologies for studying societies are used what had been expected.

Keywords: knowledge transfer, shared meaning, culture, organisational culture, teleological, peer-to-peer networking, triangulation, imaginization, organisational learning, network societies, epistemology. Singerian epistemology, complementarism, complementary scientific research methodology
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Introduction

The purpose of this master thesis is to emphasize the importance of epistemological aspects of knowledge generation and of ontological aspects of the nature of societies for understanding of IS and for its application in organisational learning and network societies. It is important to emphasis them since knowledge transfer is more and more common need because of the ICT development. In order to do that, epistemologies of functionalism, social relativism, radical structuralism and neohumanism paradigms suggested by Hirschheim and Klein (1989) are related to epistemologies of Leibniz, Locke, Kant, Hegel and Singer, philosophers discussed in five inquiring system approaches distinguished by Churchman (1971). Hirschheim and Klein derive those paradigms in his article “Four Paradigms of Information Systems Development“ from paradigms used in Burrell’s and Morgan’s book (1985) “Sociological paradigms and organisational analysis: elements of the sociology of corporate life“. In their book Burrell and Morgan suggest functionalism, interpretivism, radical humanism, and radical structuralism paradigm for the social science research.

A research that examines which methodologies predominate at universities offering degrees in social informatics is also conducted in order to get insight in which extent interpretative methodologies are in use by teachers at those universities because it is expected that interpretative methodologies are more common.

The main contribution of this master thesis research is the relation of those two well-known approaches to ISD with purpose of enhancing each of them in order to support ISD within learning organisations and network societies. The other contributions are solution for double-loop learning through multi-agent system development (MAS) and solution for developing sustainable network societies through peer-to-peer (P2P) networking combined with one centralised networking functioning as a library. I also have given an explicit explanation of the differences between monism (holism) and pluralism, in this case regarding to Leibniz’s and Locke’s philosophical views. I have revised Singer’s explanation of insufficiency of either rationalistic or interpretative approaches for explanation of natural laws and used it to generate what I named, Singerian epistemology (Se) and this is also one of my contributions in this research. I also suggested that the complementary science research methodology (CSRM) based on Singerian epistemology should be used for scientific research.

A certain revision of Hirschheims social relativism and neohumanism titles for these two of paradigms is recommended to be performed in a future research because those two terms are not enough descriptive and they are not widely in use what makes them difficult to comprehend and apply. It is suggested to prove that they can be replaced by “cultural relativist” respective “social constructivist” titles for those two paradigms.

Background

The main hypothesis in this research has been that it is possible to clarify and enhance both Hirschheim’s and Klein’s (1989) subjective-objective and order-conflict paradigms of the information systems development (ISD) and Churchman’s (1971) five inquiring system approaches, by relating them to each other. The secondary aim has been to relate the results of this synthesis to organizational learning and network societies.

Before relating the inquiring system approaches suggested by Churchman to the four paradigms suggested by Hirschheim and Klein, the characteristics of philosophical assumptions of five philosophers presented in inquiring system approaches (Locke, Leibniz, Kant, Hegel, Singer), about the nature of societies (ontology of societies) and knowledge generation (epistemology) had been identified. That has established the relevant philosophical assumptions of knowledge generation and the nature of societies necessary for relating inquiring system approaches to those four paradigms of ISD (see Fig.1).
Fig. 1 Mind map for researching a relationship between "Designing Inquiring Systems" and "Four paradigm" theories regarding their philosophical assumptions of ISD

Two figures on the right and left side of the “Inquiring System Relation to Four Paradigms” figure, present Churchman’s respective Hirschheim’s and Klein’s approaches to ISD. The names of approaches of ISD named by five philosophers who are the establishers of certain epistemology are listed on the branches of the figure on the right. The branches of the figure on the left contain four paradigms of ISD suggested by Hirschheim. The figure “Inquiring System Relation to Four paradigms” presents the relation of the theories presented on those two figures on the left and right.

Beside the enhances paradigms of ISD three approaches for problem solving are used too, “Idealized design” suggested by Ackoff (2006), imaginization described by Morgan (2006) and total system intervention (TSI) suggested by Flood and Jackson (1996).

Idealized design is approach used in order to recommend it as appropriate problem solving approach for total destruction scenarios when systems need to be developed from scratch while imaginization, to open new perspectives of organisational structure (Flood and Romm, 1996, p.150). Former is evolved from Singerian empirical idealism and experimentalism (Churchman, 1982, p.33) (Britton and McCallion, 1994, p.500) and later from dispute between mechanist and vitalist regarding ontology of living beings (Singer p.357-358).

In order to emphasize the importance of different aspects of organisation suggested by imaginization, approach for organisation development, Total System Intervention (TSI) is used.

Four Sociological Paradigms

In their article “Four Paradigms of Information Systems Development” Hirschheim and Klein use four sociological paradigms suggested by Burrell and Morgan’s (1985). Those four sociological paradigms are presented in relation to objective vs. subjective and order vs. conflict dichotomies and here follows the brief description of each of them.
Functionalism

Functionalism assumes that societies exist out of human consciousness. It states that reality can be objectively studied and it is a pragmatic view of societies in its assumption that knowledge is obtained in order to be practically used. It supposes that order in societies are primary and that societies are studied through the sociology of regulation. Its view of societies is based on sociological positivism that uses methods of natural science for “identifying, studying and measurement” of “concrete empirical” social artefacts and relationships. Functionalists apply mechanical and biological analogies of modelling societies supposing that they exist outside of the human consciousness. Functionalism has a realistic, positivistic, deterministic and nomothetic assumptions regarding the social reality (Burrell, Morgan, 1985, p.26-27)

The main aim of an approach to ISD based on functionalist paradigm is to develop system that fulfil given and clear ends for decision-making and control purpose. The approach assumes that a system analyst is an expert in methodology of ISD thus in “technology, tools and methods” and that the ends of ISD are “well articulated, explicitly agreed and non-confictual”. It is a positivistic approach which assumes that requirement analysis are objective i.e. are based on reality that is “measurable and essentially same for everybody” and that information systems (IS) can be developed as a model of the reality intending to achieve the aimed ends. Key actors are the management that determinates the ends, system developers that implement the system to be used to achieve the ends; and end users that are using the system to fulfil the ends. (Hirschheim, Klein and Lyytinen, 1995, p.69-71)

Social Relativism (Interpretive paradigm)

Social relativism rejects mechanical and biological analogies of modelling societies and insists on understanding societies from perspective of actors in societies and their individual consciousness and subjectivity. They understand societies as a network of artefacts and relationships. Functionalists apply mechanical and biological analogies of modelling societies supposing that they exist outside of the human consciousness. Social relativism is based on subjective realism and nomothetic views of social reality. The radical critique of societies regarding to this paradigm is based on structural relationships in societies and on an assumption that “radical change is build in into very nature and structure of contemporary society” (Burrell, Morgan, 1985, p.34) i.e. changes are inevitable implying that it advocates a vitalistic and organic view of societies. Its common view is that radical changes in form of political and economic crises are caused by fundamental conflicts that are common for contemporary societies and that throughout those conflicts emancipation of members of societies is achieved. (Burrell, Morgan, 1985, p.32-34)
According to Hirshheim et al. the main aim of an approach to ISD based on radical structuralism paradigm is to develop a system that “strengthen the position of working class in their struggle against capitalists domination”. A system analyst acts as labour representative that supports workers in that struggle. Key actors are owners supported by management and labours supported by a system analyst. Radical structuralism is an approach in which is assumed that a pre-existing empirical reality (a priori knowledge) exists as well as at least an objective economic reality. (Hirschheim, Klein and Lyytinen, 1995, p.76-79)

**Neohumanism (Radical humanism)**

Neohumanism does not present the concept of structural conflict but the concept of anti-organisational theory. The subjects of studies under this paradigm are radical change, modes of domination, emancipation, deprivation and potentiality throughout subjectivist perception of societies. The radical critique of societies regarding to this paradigm is based on human consciousness (Burrell, Morgan, 1985, p.32-34) in form of political individualism as an independent centre of consciousness (Lukes, 1973, p.74). It advocates nominalistic, antipositivistic, voluntaristic and ideographic view of the nature of societies (Burrell, Morgan, 1985, p.32-33) Neohumanism is an inversion of functionalist views and opposed to most of views of functionalism what implies that beside others, it does not presume societies either as organic or mechanical but rather as a network of individuals.

The main aim of approach to ISD based on neohumanism paradigm is to develop system that throughout “rational discourse” i.e. “debate, free of all social pressure” (1995, p.86), supports emancipation of different suppressed and deprived individuals and groups of people. A system analyst acts as a social therapist. Key actors are various stakeholders as customers, workers, system developers, owners of production facilities and managers. According to Hirschheim (1995, p.89) “rational discourse is an ideal that can not be fully implemented”. Neohumanism advocates a dualistic approach to problem solving applying realism and positivism for a “technical control”, and nominalism and antipositivism for “mutual understanding and emancipation”. (Hirschheim, Klein and Lyytinen, 1995, p.80-89)

**Philosophical Paradigms**

There are many philosophical paradigms but those that are discussed in this essay can be categorised as ontological and epistemological because moral, ethical and other issues are not discussed. It is important to be aware that terms metaphysics and ontology until recently (under the influence of phenomenology), were often used as synonyms to that we today call for science (Ajdukiewicz, 1977, p.76).

Ontological paradigms are theories about, beside others, existents of the reality, nature of societies and human behaviour.

Ontological realism states that reality exists independently of our cognition and perceptions (Bunge, 2006, p.29) while ontological idealism states that it does not and that it is just an idea.

The nature of human behaviour can be viewed as e.g. strictly determined by social rules or as voluntary and mostly based on a free choice of each individual member of a society. On the other hand the nature of societies can be viewed in relation to e.g. integration or conflict, stability or change and consensus or coercion dichotomies.

Epistemology is a field of philosophy with focus on the nature of knowledge (essence of truth), on reliability of knowledge (evaluation of cognition), on domain of knowledgeable (limitation of cognition) and on process of generation of knowledge (source of cognition) (Ajdukiewicz, 1973, p.7-8; Pojman, 2000, p.41).

Epistemological paradigms are based on beliefs that it is possible or on beliefs that is not possible to objectively know something. According to epistemological realism it is possible to objectively generate knowledge about reality but such knowledge is incomplete (Bung, 2006, p.29). On the other hand epistemological idealism accounts for the belief that it is not possible to generate an objective knowledge about reality to any extent.
Four classical philosophers and one contemporary and paradigms they represent

In order to fulfil the main aims of this research under this heading the four classical philosophical paradigms empiricism, rationalism, transcended idealism, absolute idealism and one contemporary paradigm, empirical idealism are briefly presented. The ideas of the representatives of each paradigm, John Locke’s, Gottfried Wilhelm Leibniz’s, Immanuel Kant’s, George Wilhelm Friedrich Hegel’s and Edgar Arthur Singer’s are presented and the same numbers are given to ideas discussing the same issue intending to simplify comparisons of their ideas regarding the dichotomies given under appendix C. One contemporary paradigm, empirical-idealism is also discussed in order to prove that it could give explanation why either positivist or antipositivist approach for studying societies is insufficient. Relating it to Nurminen’s system-theoretical, socio-technical and humanistic clarification of IS (1998, p.10) empirical idealism could be classified as socio-technical paradigm that considers both technical and human centred views of ISD as equally important.

Locke (1632 –1704 ) and empiricism

Empiricism is an epistemological view that holds that all knowledge that is acquired is generated by experience. Empiricists assume that order in societies exists and that is achieved by consensus, social contract and therefore their assumption has characteristics of contractarian’s view of societies. (Pojman, Vaughn, 2010, p.816). Empiricism asserts that reality exists independently of our cognition. (Sellars, 1917, p.151) and thus is a belief related to ontological realism.

Locke advocates empirical epistemology. (Sellars, 1917, p.151) He insists on the idea that every kind of knowledge must be generated from the experience (a posteriori) and rejects rationalist belief in existence of innate (a priory) knowledge (Locke, 1975, p.48).

He states that sensations in our mind present “something existing without us” and thus is a realist (Locke, 2011, Book 2 ch. VIII, § 7, p.98) 4a). He states that primal qualities of bodies are possible to observe objectively but secondary qualities not because there is no resemblance of those qualities in bodies at all (Locke, 2011, Book 2 ch.VIII.15 p.101), partially as epistemological realism do and that makes him to be in a base an objectivist 2a).

Locke has a pre-positivistic philosophical approach to scientific research (Gregor et al., 2005, p.6) and advocates use of methodologies of natural science for scientific research i.e. positivistic methodologies 6a).

It is obvious that Locke assumes that it is not necessary to be involved in a society in order to study it since he discusses societies that he was not ever in contact with and thus have nomothetic view of studying societies 10a). (Locke, 2011, p.44-45)

He states that a power of a society is overwhelming and that each of its member is abandoning his own interest in interest of the society in order to insure that his own interest is protected throughout protections of a common interest (Strauss and Cropsey, 1987, p.498) 7a). He claims that societies are formed by anonymous agreements of their members, and that implies that he believes that societies cannot be owned or used just by some of their parts and thus are integrated 3a) (Strauss and Cropsey, 1987, p.498). He states that members of societies rather keep a social stability then generate a change 1a). (Locke, 1980, 112) Locke’s view of social order is one related to contractarian’s view (social contract) 5a) (Cohen A.G., 2008, p.338). His contractarian view also assumes political individualism, but as involved in a consent by free choices made by individuals in societies dispute that he considers that individuals are involved in such consent automatically, by e.g. by owing a citizenship and property. (Lukes, 1973, p.75). Locke claims that men are free to decide to take an action or not, what presents voluntaristic view of human nature 8b) (Locke 1975, p.244) His view of the organisation of societies is mechanical (atomistic) 9a) (Darwin et al, 2002, p.39)

Locke claims that every individual is born without any knowledge (tabular rasa) (Locke, 1996, p.70) and that we generate knowledge from inductive reasoning with some degree of certainty (Pojman, Vaughn, 2010, p.638-369).
Leibniz (1646 –1716) and rationalism

Rationalism is a philosophical view, and according to rationalist theory of knowledge, it happens that empirical data is processed by reasoning in order to generate knowledge but assumption is that "thought is main instrument gaining the truth" (Waele, 2010, p.135). This epistemological view implies that ontological assumption of rationalism is that reality exists, because it states that knowledge can be generated as a truth, thus it is advocating ontological realism. Regarding to ontology of societies rationalists claim that among others, coherence in societies is achieved by constrains and domination. (Dahendorf, 1959, p.157)

Rationalists state that reason itself is enough for generation and acquiring some knowledge and that we possess innate (a priory) knowledge. (Pojman, Vaughn, 2010, p.605)

Leibniz advocates epistemological realism through an idea that knowledge can be generated through reasoning solely and that experiences only trigger up ("rouse up") our attention to it (Leibniz, 1705) and thus he advocates existence of innate (a priory) knowledge. He holds that mater and space are not such as they appear to us and to our senses but that they reflect "real but abstract relations". That implies that he accepts existence of reality but rejects empirical observations (sensations) as necessary approach for studying reality

From some implicit statements about ontology it can be assumed that Leibniz was realist 4a) as for example, from his following statements "All we can do with infinities is to know them confusedly and at least to know distinctly that they are there." (Leibniz, 1996. p.58) and "We are reliably assured of many past things by our memory, but we can't certainly judge whether they still exist". (Leibniz, 1996. Book IV, Ch xi, §11, p.445).

By commenting Locke' statement that primal qualities of bodies are possible to observe objectively but secondary qualities not because bodies have "no resemblance of them at all", Leibniz claims that both of qualities have resemblance of observed bodies (Leibniz, 1996. p.132) and that made him to be an objectivistivistic 2a).

Leibniz thinks that rationality is sufficient to obtain knowledge and that experience as already mentioned, only rouse up our attention (Leibniz, 1705) and that means that he finds logic and thus positivistic approach, sufficient for studying the social reality 6a) (Leibniz, 1996, p.170-171).

It is obvious that Leibniz also assumes that it is not necessary to be involved in a society in order to study it, since he discusses the societies that he was not ever in contact with as Locke do, and thus has nomothetic view of studying societies too 10a). (Leibniz, 1996, p.92-93)

Although Leibniz does not discuss Locke’s statements about the freedom (Locke, 1975, Book II, ch.xxi, §. 27, p.247) where Locke explicitly argues for a voluntaristic view of human nature, Leibniz’s deterministic view of human nature can be found in his following statements"... and although we cannot will what we want to, just as we cannot judge what we want to, we can nevertheless act ahead of time in such way that we shall eventually judge or will what we would like to be able to judge or will today." 8a) (Leibniz, 1996. Book II, Ch. xxi, §23, p.182).

Leibniz is strongly convinced that people have to obey rules and keep status quo (Leibniz ,1972, p.185) what makes his opinion very conservative regarding to a social change 1a). He suggests that societies are constituted on a hierarchy and natural subordination 5a) (Leibniz ,1972, p.77-80).

Leibniz states that we should favour positive sides of other people and be precautions only if we are involved in affair with them (Leibniz ,1972, p.81-82) implying that that should be done in order to avoid conflicts 3a). By propagating tolerance he suggests that opinions are usually not restricted because of their content but because they often exclude any other opinions (Leibniz, 1996. p.462) (Dascal, 2008, p.175).

Purpose of societies is according to Leibniz, happiness and secure of all its members in order to provide welfare 7a) (Leibniz ,1972, p.79).
Among mechanistic view, organismic view of world i.e. that world is functioning as an organism and consequently societies 9a) (Leibniz, 1998, p.222) (Illis, 1973, p.348) appears in Leibniz’s work too.

Leibniz self states that his philosophical views are more close to Plato’s then to Aristotle’s as Locke views are (Leibniz, 1996. p.48). He claims that "extension cannot be an attribute of substance” because it "implies the plurality". He uses the term monads (being) to refer to substances that build reality , each with all universal properties. Such understanding of reality is partially related to atomism but not to materialism because monads are not extended as matter is.

Kant (1724 –1804) and transcendental idealism

Transcendental idealism is a philosophical doctrine developed by Kant, and its ontological view is based on an assumption that reality exists i.e. it advocates ontological realism but that reality cannot be objectively observed and thus it advocates epistemological idealism 2b).

He claims that only the construction of our brains makes cognitive processes possible (Ajdukiewicz, 1973. p.52). He states that all knowledge is generated from experience as empiricists do, but that all of it does not arise from experience and that we posses some innate (a priory) mechanisms for interpretation of experiences (Kant, 2007, p.14) (Pojman, Vaughn, 2010, p.816) Those innate mechanisms are according to Kant’s theory of knowledge, not metaphysical knowledge as rationalists claim (Pojman, Vaughn, 2010, p.992). Experience of reality and consequently societies, according to him is partially just constructed by our brains i.e. is partially an abstraction 4b). According to Hegel, Kant’s view of knowledge is a subjectivist view (Hegel, 1977, p.57, p.67). Interesting is that Hegel states that Kant’s philosophy is categorised under idealism just because Kant claims that generation of knowledge through experience solely without an innate mechanisms for its interpretation and contrary, is not possible (Hegel, 1977, p.57, p.68). Kant suggests classification of science regarding the way of knowledge generation i.e. empirical (natural) and rational (historical) science. (Kant and Friedman, 2004. p.3-10).

Kant believes that reality cannot be objectively observed (Ajdukiewicz,1973. p.59) and consequently neither societies 6b). He does not claim that is not possible that knowledge change over a time as empiricist and rationalist do (Wyk V.G., 2004, p.50). Kant assumes that ethics is studied through “practical anthropology” (Kant, 2003. p.253) i.e. through field research and since ethics constitute a large part of a social research it means that he advocates ideographic view of studying societies 10b).

His view of societies is that they should be stable "with all one’s power towards the highest good possible on the earth, towards the universal happiness of the whole world” 1a) (Kant, 1991, p.93). This cosmopolitan view of the world implies that he believes that societies could be well-coordinated 7a). He was a pacifist and thus believed that conflicts can be avoided 3a) (Kant, 1991, p.93).

Kant views societies as associations through agreements 5a) of people buy which they fulfil their human needs (“feel themselves more human”) and throughout that association the people are developing their skills and gradually forming cultures that are consisted “of social worth of human beings”. (Kant, 2006, p.7) This implies that Kant views organisation of societies through a cultural and not through a mechanical or an organic metaphor 9b). He believes that some degree of freedom will must exist 8b) (Pojman, 2000, p.477).

Kant’s view on self-organising holistic and teleological systems is interesting because of his opinion that is not possible to develop such systems artificially and that they appear only naturally (Kant, 2003. p.557).

Hegel (1770 – 1831) and absolute idealism

Absolute idealism is a philosophical doctrine developed by Hegel. It is a form of objective idealism (Ajdukiewicz, 1973. p.97) i.e. it implies that absolute idealism states that reality does exist out of our consciousness and thus advocates ontological realism, but that it is interpreted by each observer differently, advocating epistemological idealism 6b). Its view that assumes that consciousness and its objectification of the external world are interrelating and that an object of consciousness is nothing but consciousness itself
(Burrell, Morgan, 1985, p.280) and thus that partially reality and consequently societies are constructed just by consciousness i.e. partially its appearances is just an abstraction 4b).

Absolute idealism views generating of knowledge as a dialectical process where "every question is in antagonistic relationship to itself" i.e. it is in a conflict with itself and when the conflict is resolved a higher level of knowledge is generated 3b) (Burrell, Morgan, 1985, p.280-281).

Hegel states that knowledge is dialectical process in which each thesis has its antithesis and that their synthesis has also an antithesis and etc, and that every next synthesis is more accurate than previous one (Burrell, Morgan, 1985, p.280-281). Such view directly supports change in order to achieve a higher level of knowledge 1b). Hegel rejected Kant’s theory of knowledge because he found some controversies in it (Pojman, Vaughn, 2010, p.992). He claims that we generate knowledge through inter-subjective and socio-cultural constructions (Hegel. 1998, p.111-118) and thus his view presents a subjective 2b) and ideographic view of studying societies 10b).

He assumes that will of individuals in societies is coerced by general will 5b) (Hegel. 1999, p.132).

His idea about the “plane of providence” (Hegel, Forbes, Hug, 1975, p.67) in which he claims that the world history is determinate confirms his deterministic view of societies 8a). He explains historical progress as a product of continuous reasoning and conflicts 7b) (Hegel. 1998, p.111-118) and thus of changes.


Singer (1873 – 1954) and empirical idealism

Empirical idealism is a philosophical view that can be understood as reaction on radical rationalism and radical empiricism. Edgar Arthur Singer coined the term and he states, that while we have to use experiments to bring up on surface all observable data, it still remains to interpret those data. (Singer, 1924, p.viii-ix) That briefly reflects ideas of empirical idealism. Singer self states that he is a pragmatist (Singer, 1924, p.6). Epistemology of empirical idealism is based on a pragmatic view of generating knowledge with ideas that there is no objective knowledge and thus is based on ideas of epistemological idealism, and ideas that knowledge is verified by its efficiency (Wyk, 2004, p.50) 2b). Churchman and Ackoff claim that pragmatism originates from modern rationalism and empiricism (Britton and McCallion, 1994, p.491).

Singer states that teleological laws can only be proved with interpretive methodologies because “no of teleological law of nature that we know precludes the accidental” and thus can be “proved by exceptions” while ateleological laws as laws of physics, are disapproved by exceptions if not any irregularity is involved. (Singer, 1959, p.12).

According to Churchman, Singer claims that "there are no questions which are fully understandable and have completely verified solution” (Singer, 1959, p.viii). That places Singer’s view and thus empirical idealism among subjectivist and interpretative views 6b). An implicit evidence for that can be found in Churchman’s book (1982, p.28) in which he mentions Singers appreciation of “epistemological significance of the concept of probable error” (Churchman, 1982, p.28). Singer claims that only approaching a better approximation of an ideal design is as realistic as it is possible (Singer, 1959, p .183) and that implies that he believes that reality exists, but that we can only approach to it but never reach it 4a). According to Churchman, Singer’s approach is based on “The least square Theory” and any answers to research questions have to be provided with a confidence interval (Churchman, 1982, p.12; p.117).

For Singer ideals are eternal goals that each human activity should continuously try to achieve in order to achieve better and better outcomes i.e. progress (Singer, 1927, p.280-282) and such process is called for experimentalism (instrumental idealism or nonphenomenology) (Alderson, 2006, p.311). Experimentalism advocates that an ideal can never be fulfilled but only approached and that implies that Singer advocates changes 1b).
Experimentalism promotes omnicompetences i.e. abilities of all people to fulfil their desire and not just a desire of one or few people as in case of omnipotences 7a) (Britton and McCallion, 1994, p.492-493). In Singerian system no authority is necessary and a control is achieved through feedbacks and corrections of errors (Wyk, 2004, p.96) and no coercion is used but debates 5a). Singerian inquirer similarly to Hegelian (but on moderate way) and differently than Lockean, is not looking for solutions to the problems in agreements but in conflicts of ideas and in debates (Wyk, 2004, p.97) 3b).

Ontological paradigm of empirical idealism throughout Singer’s point of view, is based on an assumption that “every mans act is an act of faith; generally, an unconscious faith; seldom, an examined faith; never, a faith that by taking thought could have been replaced by assured certainties” (Singer, 1959, p.3). That implies that he believes that human behaviour is determined.

Singer claims that if our minds are ”tabular rasa” as empiricists claim, than we would not be able to choose which experience we like or which we don’t. (Singer, 1959, p.24) That put his statement between voluntarist views of human behaviour (Churchman, 1982, p.12).

As it is observable Singer has tried to reconcile his belief in a faith and a free will but the base of its assumption remain deterministic because of his belief that “every mans act is an act of ... an unconscious faith; seldom, an examined faith” 8a).

He’s view of systems is neither mechanical nor organismic (vitalist or biological) but he tries to reconcile them. He complements the mechanic, cause-effect relationship, with that what he calls “producer-product” relationship typical for probabilistic image of the world, trying to give a solution for construction of teleological image of the world 9a) (Britton and McCallion, 1994, p.491) similar to functionalist view.

While empirical idealism contains several similarities with idealism regarding Hegel’s dialectics and Kantian “ideal pursuit” as indicator of progress (Britton and McCallion, 1994, p.492) it is in most of other aspects base on ontological realism. He also claims that:

§ 1 rational view of reality advocates laws while empiricist view facts (Singer, 1959, p.21); from now on this paragraph will be referred as the Fact-Law paragraph (FL-paragraph)

Singer had very strong influence on Churchman and Ackoff (Churchman, 1982, p.33) who were his students. His empirical idealism and experimentalism influenced both Churchman’s work on “design of inquiring systems” and Ackoff’s on “idealized design”. Singer classified Leinbizian, Lockean, Kantian and Hegelian philosophical assumptions about epistemology (Singer, 1959) and Churchman adopted his classification in his book “The Design of Inquiring Systems, Basic Concepts of Systems and Organizations” (1971)”. Churchman was working together with Ackoff in enhancing Singarian experimentalism and one of Ackoff’s work influenced by Singer is idealized design approach to artefact design.

**Ackoff’s idealized design**

Ackoff suggests that in order to develop an IS, organisation or any other artefacts it should be assumed that it is possible to do it from scratch and with intention to build an as ideal IS as possible regarding to future requirements and possibilities. While it is possible that such approach can be effective and economic for some organisations and some other artefacts, for most of the artefacts as well as for IS, development from scratch is hardly possible to ever pay off (Flensburg, 2008, p.2) and is not recommended to do it if not necessary as e.g. in total destruction scenarios According to Flood and Romm the idealized design is a problem solving approach very suitable for total destruction scenarios when systems need to be developed from scratches (Flood and Romm, 1996, p.150).

In his article “Thinking about the future” (Ackoff, 2006) he states that future possibilities can be distinguished on two ways, by “contingency planning” or by “developing responsiveness”. The first one supposes identifying future possibilities that has to be considered to avoid undesired consequences. The
second one supposes acquiring sufficient abilities to response to actual possibilities (Ackoff, 2006, p.2). He calls such approach “idealized design”. (Ackoff, Magidson, Addison, 2006)

The process of idealized design consists of an idealization and a realization phase. Under the idealization phase identification of threats that would rise up if adaptations on internal and external changes would not be achieved is accomplished i.e. as Ackoff calls it, formulating the mess. That is done by preparing:

- system analysis,
- obstruction analysis,
- reference projections – “projections of aspects of the organization's future assuming (1) no change in its current plans, policies, programs, etc., and (2) the future environment that it currently expects” and
- presentation of the mess (reference scenario) “a description of how and why the organization would destroy itself if the assumptions made were true”.

“Ends planning” is also identified under the idealization fase that assumes determining “what planners would like the organization or institution to be now if it could be whatever they wanted”.

Under realization phase the following is supposed to be done:

- means planning (what should be done in order to realise that from “End planning” stage),
- resource planning,
- design of implementation and
- design of controls.

(Ackoff, Magidson, Addison, 2006, p.5-8)

Flood and Romm also mention an approach suitable for establishing new perspectives of organisational structure called imaginization frequently used in this research thesis. (Flood and Romm, 1996, p.150)

**Imaginization**

Morgan (2006, p.6) as well as Flood and Jackson (1996, p.7-13) suggests following metaphors for organisations:

- machine as a closed system view,
- organism as an open system view,
- brain as a learning system view,
- cultures as a view that emphasize norms and values,
- political as a unitary (team) or pluralist (coalition) view and
- prison as a coercive political view.

A term metaphor must be understood only as a very overdriven analogy and not as a synonym to an analogy. For example, a hologram metaphor for organisation Morgan adopted from Karl Pribram that together with David Bohm developed a theory of human cognition, “holonomic brain theory”, is vastly overdriven in its statement that holograms are storing all information in all its parts and thus it is possible to recover all information from any of its parts in case that holograms storage device became broken (Caulfield, 2003, p.348) Regardless of that Morgan’s brain metaphor can still be partly used because is related to brains and brains have in much larger extent such capabilities. Imaginization in this essay is used in order to suggest new perspectives on a structure of organisational learning and network societies. It is used regarding to complementarism according to total a system intervention methodology.
Total system intervention (TSI)

Total system intervention (TSI) is according to Flood and Jackson (1996, p.45) an approach for planning, design, problem solving and evaluation of ISD, thus it is a methodology. It is based on “critical system thinking” a research perspective on system development that emphasize importance of:

- sociological awareness i.e. awareness of social influences on ISD,
- human well being and emancipation i.e. ISD for all and not only for owner of IS and
- complementarism in choices of methodologies instead of pragmatism and isolationism.

There are three phases of TSI:

- a creativity phase in which the metaphors that reflects current situation and which desirable condition in an organisation are discussed,
- a choice of the methodology phase according to metaphors presenting desirable condition in an organisation and
- a phase with an implementation of such methodology (Flood and Jackson, 1996, p.45).

According to complementarism each metaphor has its advantages and disadvantages and no metaphor should be excluded but rather some of them should be prioritized. Such complementary science research (CSR) approach to choice of metaphors is also useful for improving learning organisation’s activities.

Learning organizations

Lipshitz, Friedman and Popper state that the main reason for assumptions that organizations can learn is anthropomorphism since individual learning is a cognitive process while organizational learning is a social process (Lipshitz, Friedman & Popper, 2007, p.9). While organisations cannot learn as individuals do it is possible to apply some learning mechanisms from human learning approaches to organisational learning.

To achieve a competitive advantage organisations have to continuously learn and that also includes, have to learn how to learn what is one of main characteristics of learning organizations. (Lassey, 1998, p.7).

According to Senge basic characteristics of learning organizations are: “system thinking, personal mastering, share vision, mental models and team learning (dialogue)” (Senge, 2006, p.x, p.6). An learning organization can be described as a sum of individual learning, but there must be mechanisms for individual learning to be transferred (knowledge transfer mechanism) into organizational learning (Wang , Ahmed, 2003, p.18-17).

Organizational learning

Learning in learning organization i.e. organizational learning is not achieved only intentionally, through education but through experience as well, learning by doing (Smith, 2006, p.561). While learning organization is one kind of organization, organizational learning is one of activities within an organization (Denton, John, 1998, p.3) that leads individuals, groups and entire communities through transformation (Langer, 2005, p.67).

According to Chris Argyris organizational learning is a process that occur as a result from organizational inquires that proceed “the mismatch between expected and actual results” experienced by participators within an organization. Those results became as he writes, “embedded in the images of organization held in its members’ mind and/or in the epistemological artefacts (the maps, memories, and programs) embedded in the organizational environment”. (Argyris & Shôn, 1966, p.16) As products of such organizational inquires following changes within organization occur (Argyris & Shôn , 1966, p.17):

a. interpretation of past experiences of success or failure,
b. inferences of casual connections between actions and outcomes and their implications for future action,
c. description of the shifting organizational environment and its likely demands on future performance,
Effectiveness of organizational learning depends on level learning is implemented in behaviour of participants within an organization. (Denton, 1998, p.158)

Organizations are learning on two different ways i.e. by single and the double loop learning models (see Fig.2). The first one happens throughout experience, by implementing organisational plans with error corrections without modifying the governing variables (Argyris, 1999, p.67-68). The second one, throughout double loop learning that always requires modifying governing variables (Argyris & Shõn, 1996, p.22) i.e. organisational values and norms before an action is changed, but not “underlying beliefs and values” of individuals (Argyris 1999, p.68). One of the most important characteristics of organizational learning is continual revision of organization’s performances, achievements and oncoming activities. (Flood, 1999, p.90)

Single loop learning is proper for programmable tasks while double loop learning for tasks with unpredictable outputs (Argyris, 1999, p.69). Argyris states that if a thermostat that use single loop learning, would be able to rethink and modified its settings by itself then it would be able to accomplish double loop learning (Argyris, 1999, p.68).

Single and double loop learning are related to first and second order of learning and to adaptive and cognitive learning. The first order of organization learning results in changing “management organization, decision process, work routines or allocation of recourses” i.e. ”routines”. The second order of organization learning results in changing “company’s frames of references, shared mental models, culture, strategy and/or programs” i.e. ”new meanings”. (Abraham & Docherty, 2003, p21-22) The adaptive organizational learning is “goal-oriented activity system” while the cognitive organizational learning is “sets of interdependent members with shared patterns of cognition and belief”. (Argyris & Shõn in Langer, 2005, p.67-68)
Organizational learning is performed by effective accessing and modifying shared information throughout collaboration tools. Computer supported cooperative work (CSCW) is one of collaboration tools for coordinated access to shared information through the ICT (Greif, 1998, p.447) especially through multimedia (Borghoff & Schlichter, 2000, p.90-91). CSCW is closely related to computer-supported collaborative learning (CSCL) which development is partly influenced by CSCW. Differences between them are, in contents, processes and outcomes i.e. while CSCL concerns learners, participations and learning, CSCW concerns members, processes and products of organisation (Heeren, 1996, Hrastinski, 2007). CSCL is most commonly used for e-learning and workplace e-learning (work integrated e-learning).

Both CSCW and CSCL are achieved throughout different kind of interaction regarding time and space proximity as it is presented in “Johansen time-space matrix” below (Fig. 3) (Penichet et al., 2007). Users of CSCW system interacting in the same place and at the same time are involved in a ”face to face” interaction as e.g. in classrooms, while users interacting at the same time from different places are involved in a ”synchronous distributed” interaction as e.g. by chatting while they are in different cities. On other hand users interacting in the same place but on a different time are involved in an ”asynchronous” interaction as e.g. by using the same ICT devices in the same room but on a different time, while users interacting in different time and from different places are involved in an ”asynchronous distributed“ interaction as e.g. in communication by email from offices in different cities.

Until recent two decades the most common view of the information systems was that their improvement could be achieved solely by technological development but today is also more and more common view that information systems are social systems technologically supported (Hirschheim, Klein and Lyytinen, 1995, p.1). Since development of CSCW is based both on social science focusing on understanding the nature of societies and on engineering science focusing on development of systems for groups (Ackerman, 2000, p.13) CSCW is suitable for overcoming “socio-technical gaps” that appears when expectations of a technical support for social activities are not fulfilled (Ackerman, 2000, p.1).

Organizational learning and thus learning organizations are mainly relaying on explicit knowledge generation (Ikujiro & Krogh, 2009, p.635–652) and importance of tacit knowledge is ignored because tacit and explicit knowledge are understood as opposite and separate of each other and not as they in fact are, “mutually complementary” and “dynamically interacting with each other” (Ikujiro & Krogh, 2009, p.291). This is going to change and tacit knowledge will be more and more important (Lundvall & Nielsen, 2007, p.208) since explicit knowledge in “non-verbal communication” stays for the only 20%”. (Bush, 2008, p.xi)
Similarly, informal and formal learning are often presented as they would be in conflict with each other. Informal and formal learning through their interaction and "reflection" are complementing each other (Svensson, Ellström, Åberg, 2004, p.481) and thus are supporting competence development as it is presented in the figure below (Fig.4).

![Learning by reflection leads to competence](image)

Fig. 4. Learning by reflection leads to competence; source: (Svensson, Ellström, Åberg, 2004, p.481)

If intending to increase competence development organizations should also use competence management (CM) and competence management systems (CMS) for reducing gaps between desired competences and competences members of an organization posses. Competences occur in explicit or tacit form and there are “four conversion modes” that can be used to transferred them between members of an organization (Fernandez & Leidner, 2008, p.5, Noaka, 1994, p.19):

- tacit to tacit through socialization,
- tacit to explicit through externalization,
- from explicit to explicit through combination and
- explicit to tacit conversion mode through internalization."

In order to create values through transforming knowledge of individuals and teams of an organization into usable knowledge and increase organizational competitive advantage, organisations should use knowledge management (KM) (Aggestam, 2006, p.295). KM is more focused on transforming knowledge internally within an organization than on interactions between organizations.

Learning organisations that use some or all Churchman’s inquiring systems are called inquiring organisations (Courtney, Haynes, Paradise, 2005, p.ix) and are characterised by application of multiple organisational forms (Courtney, Haynes, Paradise, 2005, p.2). An inquiry is a process of finding a solution to a problem on most efficient way throughout inquirer’s interaction with its environment (Wyk, 2004, p.51). Each of inquiring systems is suitable for certain situation and properly applied in form of homeostasis, considering both holistic and stratified approaches to inquiring system development, can together be used for efficient problem solving (Courtney, Haynes, Paradise, 2005, p.3).

The attempt by Hall and Croasdell (Courtney, Haynes and Paradise, 2005, p.24-21) to relate Churchman’s inquiry systems to learning organisations is not completely accurate because they related the organism metaphor of organisation to Kantian inquirer and the cultural metaphor to Lockean while it should be inverse as it is presented under heading “Results”.

Borislav Marić  2012-08-31
Morgan mentions in his book ”Images of organisation” (2006, p.87) that learning organisations could be understood through brain metaphors too and thus such metaphor could be used for network societies too.

**Network Societies**

One of characteristics of network societies is that they are based on ICT and technological paradigm which assumes that information is used by technologies as raw materials and not just that development of new technologies is influenced by information (Castell, 2010, p.70). The technological paradigm has opened opportunities for rise of knowledge economy; and development of IT knowledge management, distributed and mobile communication, lifetime learning and e-learning are some of the characteristics of knowledge economy (Castell, 2006, p.215). In contrast to traditional learning that supported knowledge transfer i.e. content, e-learning throughout web technology supports knowledge sharing, building and coaching i.e. communication accessible to many and at any time and place especially for communities of practice. (Castell, 2006, p.218-220) thus for work integrated learning (WIL).

While all metaphors of organisation can be applied to network societies too, view of organisation as a brain seems to give one new perspective on network societies as organisations that continue to be functional even when many parts of their network crash down (Morgan, 2006, p.100). It is important to be aware that exist neurones in grey mater of the brain (cerebral cortex- outer par of cerebrum) that are the only cells in human body that if not injured, are not regenerated (Spalding et al. 2005, p.134) and that means that information as life long memory, could be stored there. Grey mater also handles information processing, while other parts of the brain are probably only able to transfer signals from different parts of grey meter. It is possible that information is distributed outside of the central part of the brain in order to get more storage place but also in order to achieve endurance and recoverability of the brain.

According to Cohen at al. it is proved that Internet has capability to almost completely recover capacity it had before random breakdown (Choen, et al., 2001, p.1-4) That is not case during intentional attacks and in fact Internet is very vulnerable for intentional attacks (Cohen, et al., 2000, p.1-3). That means that Internet and network societies have the same capability of recovering as the brain does but it takes some new networking strategies in order to prevent information and knowledge losses and some are given in this essay.

**Methods**

In order to relate Churchman’s approach to Hirschheim’s and Klein’s approach to ISD regarding their philosophical assumptions of ISD, in the beginning of this research literature reviews regarding Churchman’s (1971) five inquiring system approaches and Hirschheim’s and Klein’s (1989) subjective-objective and order-conflict assumptions of information systems development were made. The other relevant literature reviews regarding philosophical theories discussed in Churchman’s book and in Hirschheim’s and Klein’s article were also conducted.

An approach called “mixed method” was used that applies both qualitative and quantitative methods for data collections and interpretations. Together with the literature reviews it formed a triangulation method and a pragmatic approach of this research. During the research an exploration was made in order to make a confirmatory investigation (Denscombe, 2007, p.116; Blaxter, Hughes, Tight, 2006, p.84-86) and the relation of Churchman’s and; Hirschheim’s and Klein’s theories regarding their philosophical assumptions of ISD.

The mixed method was used to improve the accuracy and presentation of the research results. In order to make further improvements of the research results the research was made as a pragmatic iterative approach. Priorities to qualitative respective quantitative methods and analysis were shifted and evaluated in order to avoid a pure positivistic respective interpretative approach to research. (Denscombe, 2007, p.113-116)

I performed a descriptive research with a survey (Dawson, 2005, p.27) as a research method. The qualitative approach for data collecting was done in form of a literature survey while the quantitative
approach in form of a questionnaire as a method for *structured interviewing* (Russell, 2006, p.51). The questionnaire was made as an Internet survey (Denscombe, 2007, p.9) while the literature research both as an Internet survey and as printed-book reviews. The questionnaire was constructed so that the most important questions were placed first. The questions were arranged from general to specific and to avoid as much as possible implications on interviewed persons, similar questions were not placed one after the other.

The main target audience (Dawson, 2005, p.29) of the questionnaire were employees at universities doing research regarding social informatics. The main purpose of the questionnaire was to find which research methods and methodologies they used and if other methods then positivistic were used more frequently.

The questionnaire contains ten dichotomies and interviewed persons were asked to choose aspects of dichotomies that best described their view of societies or to attach a grade between 1 and 10 to each aspect of dichotomies. The dichotomies regarding integrationist vs. coercion view of societies were generated from Dahendorf’s book (1959, p.162) while those regarding subjective vs. objective approach to social science from Burrell’s and Morgan’s book (1985, p.3-9). The dichotomies regarding subjective vs. objective views of the social reality given by Burrell and Morgan are: (1985, p.3-9):

- Realist /Nominalist,
- Positivist / Antipositivist,
- Determinist / Voluntarist and
- Nomothetic / Ideographic.

Descriptions of premises regarding integrationist and coercion view of societies according to Dahendorf (1959, p.161-162) are the following:

**Integrationist:**
- Stability
  *Every society is a relatively persistent, stable structure of elements.*
- Integrity
  *Every society is a well integrated structure of elements.*
- Functional coordination
  *Every element in a society has function, i.e., renders a contribution to maintain as a system.*
- Consensus
  *Every functioning social structure is based on a consensus of values among its members.*

**Coercion:**
- Change
  *Every society is at every point subject to processes of change; social change is ubiquitous.*
- Conflict
  *Every society displays at every point dissensus and conflict; social conflict is ubiquitous.*
- Disintegration
  *Every element in a society renders a contribution to disintegration and change.*
- Coercion
  *Every society is based in the coercion of some of its members by others.*”

(Dahendorf, 1959, p.162, Burrell, Morgan, 1985, p.12-13)

Questions are presented as choices of dichotomies labelled as “a” or “b”. Even-numbered questions answered with the solution “a” present the questions regarding integrationist (stability) dichotomies while even-numbered questions answered with “b” present coercion (change) dichotomies. Odd-numbered questions answered with the solution “a” present the questions regarding objective dichotomies while odd-numbered questions answered with “b” present subjective dichotomies (see appendix B).
Results

The following are the results of this research:

- the synthesis of the two above described approaches to ISD forming the enhanced four paradigms of ISD,
- the solution for achieving the double-loop learning through multi-agent system development,
- the solution for developing sustainable network societies through peer-to-peer networking combined with centralised one and
- the complementary science research methodology (CSRM) based on Singerian epistemology.

The Hirschheim’s and Churchman’s approaches to ISD have been related and used since they consider the importance of epistemology for ISD. The synthesis of those four approaches to Churchman’s inquiring systems gives more explicit understanding of both Hirschheim’s and Churchman’s approaches to ISD and thus clarify situations each of ISD paradigm are suitable for.

The basic idea is that self-organising systems should be used for supporting organisational learning and network societies and that such systems are supposed to be based on Singerian experimentalism i.e. approach in which is assumed that fully self-organizing (sustainability) systems cannot ever be achieved but only approached. Mobile networking is offering many of such self-organising capabilities because it is based on more distributed systems than traditional networking because of the nature of mobility. It is not possible to suppress information (Castell, Qiu and Linchuan, 2006. p.185) and knowledge transfer in mobile networking on such scale that it would be not be possible to generate knowledge transfer and change.

While there is quite important to be aware that development of IS from scratch is hardly possible to ever pay off (Flensburg, 2008, p.2) and thus is not recommended if not necessary as in total destruction scenarios when is not expected for system development to be profitable and in most cases is subvented by governments, it is very important to put more attention on improvement of interactions between legacy systems and new ICT because of rapid development of ICT and distributed communication.

Development of distributed communication and Internet has established opportunities for development of networks societies that are largely depended on communication and knowledge transfer. Knowledge transfer is one of the most important issues of IS and in this essay the importance of understanding epistemology for ISD regarding efficient knowledge transfer has been discussed. The synthesis of Hirschheim’s and Churchman’s approaches to ISD i.e. “Enhanced Four Paradigms of Information Systems Development” (EFPISD) has been related to IS supporting organisational learning and network societies in order to suggest strategies for improvement of their knowledge transfer capabilities and strategies for improvement of their adaptability to changes and their endurance to information and knowledge losses, respectively.

Enhanced Four Paradigms of Information Systems Development

In order to enhance Hirschheim’s and Klein’s four paradigms of information systems development presented under heading “Four Sociological Paradigms” by relating it to Churchman’s inquiring system, the relevant philosophical assumptions of each five represents of inquiring system approaches (Locke, Leibniz, Kant, Hegel, Singer) about the nature of societies and knowledge generation has had been identified under heading “Philosophical Paradigms”. Those five philosophic paradigms in relation to four paradigms of information systems development are presented in the two diagrams below (Fig.5 and Fig.6).

While inquiring systems could be based on views of other philosophers, the Lockean, Lebnizian, Kantian, Hegelian and Singerian inquiring systems suggested by Churchman are used because epistemologies of those five philosophers are assumed to be “opened for discussion” (Churchman, 1971, p.18) what makes them quite relatable to Hirschheim’s and Klein’s four paradigms of ISD.
On the diagram above (Fig.5) the assumptions that each philosopher has regarding ontology of societies and epistemology are presented, in which darker nuances of cubes represent “a)” and brighter “b)” solutions related to the questions mentioned under heading “Methodology” and under appendix C. The odd numbered questions answered with “a)” present integrationist (stability) aspects of dichotomies while odd numbered questions answered with “b)” solutions present coercion (change) aspects of dichotomies. The even numbered questions answered with “a)” present objective aspects of dichotomies while even questions answered with “b)” solutions present the subjective aspects of dichotomies. (see appendix B).

From the diagram above we can observe that Locke’s and Leibniz’s epistemological and ontological views are mostly in agreement with all answers both regarding integrationist (stability) and objective aspects of dichotomies and that means that their views are strongly in agreement with functionalist paradigm.

Kant on the other hand views societies as integrated and stable; and knowledge generations as subjective, and thus shares views with social relativists regarding all questions. He has slightly different view of organization mostly because of the structure of the 9th question that excludes cultural aspects but which are in large extent presented in network aspects of organism/network dichotomy.

Hegel’s and Kant’s views are in agreement with subjective aspects of dichotomies but in difference from Kant, Hegel thinks that behaviour of members of a society is determinate as well as social changes. His views differ from neohumanist views only in that he views societies through an organic metaphor and not as a network of individuals but in fact that could be questioned and it could be that he views it as organismic.

Singer’s views are pragmatic and therefore partly in agreement with all four social paradigms. He shares most similar views with Kant and Locke, which are moderated views advocating the stability with characteristics of integrationist views. He also has some views similar to Hegel’s but rather moderate, supporting changes rather then stability and advocating conflicts of ideas and dialectical debates rather than agreements. His views regarding the determinism and the faith are in agreement with radical structuralists paradigm as Hegel’s. He tries to reconcile the mechanical and organic (vitalist or biological) view on organisation. His idea of experimentalism associates his views regarding the questionnaire in this research with interpretativist views, mostly in agreement with social relativist paradigm.

The relation of the philosophical views of those five philosophers with four social paradigms are presented in diagram below (Fig. 6). While the right side of diagram presents subjective (interpretativistic) and left objective epistemology, upper side presents harmonic and order and lower side coercion and conflict.
assumption of nature of societies. The circles with numbers present the questions that are not typical for the certain paradigm that each philosopher share most of similar views with. In case of Singer all question numbers related with paradigms are presented because empirical-idealism is a pragmatical paradigm and contains some characteristic from views of all four classical philosopher. Singer’s views regarding 1st and 3rd questions are in agreement with neohumanist paradigm because they are concerned more with knowledge generation as Hegel’s then with political changes and conflicts as radical structuralist views are. Similarly, his views regarding realism that he shares with Locke and his intention to reconcile (unify) vitalistic (organic) and mechanistic assumptions of societies associate his views with functionalists views regarding 4th respective 9th question. Since he promotes omnicompetences it would be too radical to compare his view regarding the 7th question with functionalist view. It is much more reasonable to compare it with social relativist view because it rejects mechanical and organic (biological) metaphors of modelling societies. Singer’s view regarding 5th question is similar to Kant’s view of agreement rather then to social contract as Locke’s view, and therefore is associated with social relativist view. His view regarding 3rd, 6th and 10th is much more based on agreement then on conflict as Hegel’s view and therefore is similar to Kant’s view of knowledge generations and thus to social relativist view. Leibniz’s view regarding 5th question is associated with radical functionalist view because of its deterministic aspect of coercion in societies that are according to his view, constituted on a hierarchy and natural subordination. Locke’s view regarding 5th question is associated with social relativist view because he views societies as ordered.

The circles without numbers present the relation of the views of each philosopher to four paradigms of ISD, that are self-evident from the reviews under headings “Philosophical Paradigms” and appendixes C and B and therefore they do not contain any numbers.

![Enhanced four paradigms of ISD diagram](image)

It can be noticed that the assumptions of Locke and Leibniz do not differ in some other questions than in 8th question. It is important to emphasis that according to many authors Leibniz’s view of societies regarding to 9th question, is as closed and mechanical in contrast of Locke’s view, as open and mechanic, but in this essay the reference has been given where is stated that Leibniz in fact views systems as organismic too. That view is probably Leibniz’s general view of societies and the misinterpretation that he only had mechanical view adopted from Descartes was developed by many authors because mechanical analogies regarding nature societies were usual view in the few decades after the industrial revolution. It is also interesting that Leibniz claims that hierarchies and natural subordinations are inevitable and that he believes that human nature is deterministic while Locke on the other hand, advocates the free will of members of a society. With exception of those two questions both Locke’s and Leibniz’s views are mostly in agreement with functionalist views as it is evident from the figure above (Fig. 6) and from appendix C and E.
It is very important to understand that Locke in difference form Leibniz’s monistic (holistic) worldview, has pluralistic worldview (Churchman, 1971, p.71-76) what is the basic and most important difference of their philosophic views regarding both ontology and epistemology.

In case of Leibniz (rationalism) monism is expressed in his monadology and that explains his claim on “sufficiency of ‘a priori’ knowledge for cognition process” because that is according to his epistemology, the only way that reality (as a hole) could be comprehended because it is not possible to observe the hole reality and at the same time be included in it. On other words Leibniz claims that it is only possible to comprehended reality as a hole from inside (a priori) and not from outside (a posteriori e.i. observation).

Locke (empiricism) insists on empirical data as the only way to comprehend reality in any extend and consequently on the induction (with some degree of certainty) as a method for achieving objectivity because of the same reason i.e. it is not possible to observe the hole reality and at the same time be included in it.

As it is self-evident both Locke and Leibniz have the same start point i.e. it is not possible to observe the hole reality and at the same time be included in it but they have different methodologies for generating knowledge about reality i.e. the observation (a posteriori knowledge) and inductive reasoning with some degree of certainty; and “a priory knowledge and monadology”, respectively.

Kant and Hegel have interpretativist worldview that excludes objectivity therefore are not form of objectivist views relevant for this discussion just above. Similarly, Singer’s view that data collected through observations on the end still has to be interpreted by each individual is interpretativist worldview and thus his views are not relevant for this discussion just above either.

Singerian epistemology (S-epistemology)
Singer recognises a very important distinction between teleological and ateleological natural laws and gives an explanation for insufficiency of either rational or interpretative understanding of science for explanation of natural laws. He states that teleological science laws are not possible to verify with rationalist approach while ateleological not with interpretive because as he states, “no of teleological law of nature that we know precludes the accidental” and thus can be “proved by exception” while ateleological science laws are disapproved by exception if not any irregularity is involved. (Singer, 1959, p.12). The real true is that teleological science laws are not necessary disapproved by exception and neither by exceptions while ateleological science laws always are and from now on, last statement will be referred as the Singerian law (S-law).

Singerian law (S-law) implies that:
§ 2 - Teleological natural laws should be studied with interpretative research methodologies because they are not necessary disapproved by exceptions and that ateleological natural laws should be studied with positivist research methodologies because ateleological science laws always are disapproved by exemptions; from now on this paragraph with be referred as the Empirical Idealism law (EI-law).

In order to clarify enhanced four paradigm of ISD (EFPISD) matrix was constructed and named Singerian matrix (S-matrix) and it is related two of Singer’s statements:
- **Empirical Idealism law (EI-law)** above based on the explanation of the insufficiency of either rationalist or interpretative approaches for explanation of natural laws (Singer, 1959, p.12) and
- **FL-paragraph (FLp)** – the statement that rationalist view of reality advocates laws while empiricist view facts. (Singer, 1959, p.21)

S-matrix reflects Singerian categorisation of the “Theory of evidence” as Empiricism, Rationalism, Criticism and Dialectic (Singer, 1959, p. 7-9) as it is presented in the table below which could give better foundation for understanding his philosophical ideas he named Empirical Idealism and thus some aspects discussed in this research thesis too.
As it can be observed from S-matrix below:

- Empiricist relies on facts and research methods for natural ateleological laws,
- Rationalist relies on laws and research methods for natural ateleological laws,
- Criticism relies more on laws and research methods for natural teleological laws then on facts and
- Dialectic relies even more then Criticism on laws and research methods for natural teleological laws then it relies on facts.

<table>
<thead>
<tr>
<th>S-matrix</th>
<th>NATURAL LAWS</th>
<th>Ateleological (atl)</th>
<th>Teleological (tl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REALITY</td>
<td>Facts</td>
<td>Empiricism (Locke LE)</td>
<td>Criticism (Kant KC)</td>
</tr>
<tr>
<td></td>
<td>Laws</td>
<td>Rationalism (Leibniz LR)</td>
<td>Dialectic (Hegel HD)</td>
</tr>
</tbody>
</table>

Table 1. Singerian matrix (S-matrix)

Here follows the explanation of the approach the table was constructed. While they are many philosophers that can be associated with those four philosophical paradigm Singer as well as Churchman discuss just as it can be called, Lockean empiricism (LE) Leibnizian rationalism (LR), Kantian Criticism (KC) and Hegelian Dialectic (HD).

Churchman distinguish four following pathways for designing inquiry systems generated from concepts that elementary to complex process, and nature of inputs are optimal for inquiring systems (Churchman, 1971, p.19-20):

- elementary inputs which are clear and distinct (Lockean),
- clear and distinct ideas that are not inputs (i.e., not given externally) (Leibnizian),
- unclear inputs (Kantian), or
- unclear materials that are not inputs (Hegelian).

Namely, one of the most important issue discussed by Churchman (1971) is the role of guarantor, referring to Singerian categorisation of the “Theory of evidence”. On the other word how are we supposed to be sure that the information we use as the input of inquiring system is reliable? “Where is guarantor?” (Churchman, 1971, p.216). or as Churchman frankly writes : “But what about the question: is there progress or merely process? Which is the same as the thematic question of this book: does the inquiring system generate knowledge of reality or (of) its own form of illusion?” (Churchman, 1971, p.204)

Because of the absence of concrete solutions for the earlier described problem of guarantor, he recognize Lockean, Lebnizian and Kantian inquiry systems regarding the assumptions of the nature of the inputs, not satisfactory (Churchman, 1971, p.274-277) and implicitly recommends Hegelian inquiry systems, as Churchman self writes in following statement: “In this and the next few chapters we shall see that there are very convincing arguments to show that the first three alternatives are unsatisfactory from design point of view.” (Churchman, 1971, p.20).

Churchman claims that necessary condition for objectivity is that “the behaviour of en inquirer be capable of being observed”. He states that for Kant “objectivity occurs when experience is shaped into a ‘general object,’ i.e. gains its form and intelligibility form space, time and the categories. But even this shaping of experience is not enough ...”. He continues after while stating “For Lockean inquires, all that is needed to attain the objectivity of simple property is a strong agreement, the so-called objectivity of the property becomes no more then a convention that- in case of computers- can be changed at will changing a program”. Regarding Locke’s inquirer he concludes that “No observation can become objective unless observer is also observed objectively”. (Churchman, 1971, p.149-150).
From already mentioned claim form Burrell and Morgan that Hegel states that knowledge is dialectic process in which each thesis has its antithesis and that their synthesis has also an antithesis and etc, and that every next synthesis is more accurate than previous one (Burrell, Morgan, 1985, p.280-281) it can be understood that Churchman recommends Hegelian inquiring system because of the dialectal process for generation of knowledge that insure that observer will be observed too i.e. it will be an antithesis even to a synthesis "up to the stage of Absolut Mind” i.e. to the supreme mind (Churchman, 1971, p.175) as Hegel is convinced.

But is it reasonable to expect the objectivity in the case of Kantian inquiry system, which is based on an assumption that reality is subjective i.e. is based on epistemological idealism, as it is reasonable to expect it fin the case of Lockean and Leibnizian, based on epistemological realism? Of course not. That indicates that Kantian inquiring system according to the epistemology it is based on, is the proper system for interpretative inquiries. Regarding Lockean inquiring system it can be concluded that since functionalism is based on agreement and conventionalism Lockean inquiring system can be accepted as suitable for that paradigm. Leibnizian inquiring system is quite difficult to support form Churchman’s reference point i.e. objective guarantor, because of Leibniz assumption of the existence of the innate objective reasoning.

Table 1. was constructed by adding the Churchman’s recommendation for Hegelian inquiring systems to following Singer’s theories of evidence:

- **Rationalist** - No knowledge of law implies knowledge of facts; all knowledge of fact does imply knowledge of law.
- **Empiricist** - All knowledge of law implies knowledge of facts; some knowledge of fact does not imply knowledge of law.
- **Critical** - Some knowledge of law implies and some does not imply knowledge of fact; Some knowledge of facts implies and some does not imply knowledge of law.

(Singer, 1959, p.80)

- **Dialectic** – the entire process lead to ever expanding and ever more redefined model

(Churchman, 1971, p.175).

Singer mentions “Dialectic” in the same discussion but without suggestion about position of the Dialectic in relation to facts/law dichotomy:

“It remains to be seen, first how far the summary account the preceding Dialectic offers of the three schools (theories of evidence) it has reviewed, will enable us o establish the ‘attitude’ of each of the schools toward each of the proposition and, second, whether from such attitudes as we are able to establish. Wee may construct a classification-frame that will assure the mutual exclusiveness of the classes to which these schools are to be severally assigned.

(Singer, 1959, p.80).

On the end of his discussion about theory of evidence he wonder: “… is there no theory of evidence to be found in history, that holds knowledge of law to depend on knowledge of facts and conversely?”. (Singer, 1959, p.85)

The tables constructed in this research are not presenting the frame Singers is writing about thus neither “Table 1”. The theories of evidence classified by Singer are used to construct table regarding FL-paragraph (FLp) since they discuss the same Singerian dichotomy law/facts. As mentioned, according to FL-paragraph (FLp) rationalist view of reality advocates laws while empiricist view facts as presented in “Table 1”.

While we can argue for that Kant respected importance of the facts for knowledge generation he still propose innate knowledge as sufficient for it to happen as rationalist do, and propose that all knowledge does not arise from experience and that we posses some innate (a priory) mechanisms for interpretation of experiences, that is by any mean very different view of empiricist view and thus he cannot in large extent advocate facts but laws as it is presented in Table 1.
As it is mentioned before Hegel states that Kant’s philosophy is categorised under idealism just because Kant claims that generation of knowledge through experience solely without an innate mechanisms for its interpretation and contrary, is not possible (Hegel, 1977, p.57, p.68). That implies that Hegel find himself to be more idealist then Kant. As Singer states “The name idealist suggest one who has, in whatever way, succeed in emancipating himself from the tyranny of the facts, or has (as those that love him not would say) lost his hold on reality” (Singer, 1959, p.55) which together with the former statement of Hegel implies that in relation to \textit{FLp} Hegel favours more laws than Kant does. It is noticeable that in “Table 1” is presented that Dialectic thus Hegel’s view of reality advocates more laws then Kant’s (the position of “Dialectic “ is slightly lower then that of Criticism”).

Now we can put attention on Fig.6 again and on sign $\otimes$ in the middle of the picture that presents an imaginary vertical line on those lines presenting objective/subjective and order/conflict dichotomies. The line presents dichotomies facts/laws. Now lets imagine that the line’s start point is somewhere in front of us and that from that point to the sign $\otimes$ presents facts and after that laws. Now put attention on each frame and you will notice that some frames are going under and some above (the red one) the lines that are presenting objective/subjective and order/conflict dichotomies, depending on data from “Table 1”.

We can also notice that the frame presenting Singerian view regarding the questionnaire is under part of line presenting “conflict” while otherwise is above, depending on the position in which the coloured circles with the numbers in the frame, are in relation to those four paradigms. The figure 6 presents “Enhanced four paradigms of ISD diagram”, EFPISD diagram.

In order to find relation between scientific fields and Singerian dichotomies law/facts and att/tel we relate the Boulding’s classification of systems to Singerian matrix as in the table below (see Table 2).

<table>
<thead>
<tr>
<th>S-matrix</th>
<th>Ateleological (atl)</th>
<th>Teleological (tl)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts</strong></td>
<td>Biology</td>
<td>Social Science</td>
</tr>
<tr>
<td>Open systems, Lower organisms, Plants, Organisms, etc</td>
<td>Socio/cultural systems, Transcendental systems, Human behaviour, Artefacts, etc</td>
<td>Human Beings, Organs, Genes, etc</td>
</tr>
<tr>
<td><strong>Laws</strong></td>
<td>Physics</td>
<td></td>
</tr>
<tr>
<td>Structures, Energy, Frameworks, Clock works, Control mechanism, Inorganic structures, etc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Singerian matrix presenting the fields of study regarding to EI-law in relation to Boulding’s classification of systems

The relation of Empirical Idealism law (EI-law) and FL-paragraph (FLp) will from now be referred as the Singerian epistemology (S-epistemology). Finally, we can present the relation between ”Enhanced four paradigm of ISD (EFPISD)” with Singerian epistemology in CSR methodology diagram (CSRMD).

<table>
<thead>
<tr>
<th>S-matrix</th>
<th>Ateleological (atl)</th>
<th>Teleological (tl)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facts</strong></td>
<td>Functionalist</td>
<td>Social Relativist</td>
</tr>
<tr>
<td>Empiricism (Locke LE)</td>
<td>Criticism (Kant KC)</td>
<td>Dialectic (Hegel HD)</td>
</tr>
<tr>
<td><strong>Laws</strong></td>
<td>Rationalism (Leibniz LR)</td>
<td></td>
</tr>
<tr>
<td>Theoretical</td>
<td>Experimental</td>
<td>Applied</td>
</tr>
<tr>
<td>Mathematics</td>
<td>Physics</td>
<td>Biology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Enhance four paradigm of ISD in relation to Singerian epistemology – CSRMD
It is interesting to observe that Singerian epistemology differs from Kant’s who suggests as already mentioned, classification of science as empirical (natural) and rational (historical) science. On other hand Singer epistemology suggests that physics should be studied by rationalist approach advocating laws, because physics is trying to obtain and distinguish the laws that precede a phenomenon. Singer epistemology (Se) clarify positivist v. interpretativist debates making them easier to understand.

It is recommended that theories of evidence should be used complementarily e.g. theoretical physics should be studied by rationalist approach while experimental physics by empiricist approach. Since Hegel views society through organic metaphor, “Dialectic” is more appropriate for studying medicine then for studying social science. While medicine uses engineering and hence applied physics that could use both results achieved by experimental and theoretical physics i.e. could use both empiricist and rationalist approach to research, but by prioritising the former, that should be fairly more common for social science.

That implies that for a natural science research a complementary science research CSR methodology (CSRM) should be used that recommends that theoretical research for natural science fields should use Rationalist research methods complemented with Empiricist and interpretative research methods, and that experimental research for natural science fields should use empirical research methods complemented with rationalist and interpretative research methods.

Theoretical research for social science fields should use interpretative research methods supported with more rationalist and less empirical research methods as e.g. for social informatics, and inverse i.e. interpretative research methods supported with less rationalist and more empirical research methods should be used for applied science as e.g. for health informatics.

While “Dialectic” and “Criticism” used for research in applied science should use interpretative research methods supported with more empirical then rationalist research methods, “Dialectic” and “Criticism” involved in social science should use interpretative research methods supported with more rationalist and less empirical research methods.

Relating this Master Thesis research methodology to CSRM it appears that in the research are used the interpretative research methods base more on Criticism (literature survey and review) as qualitative approach for data collecting then on Dialectic (questionnaire as structured interviewing), more supported with Rationalist (logics and mathematics) then with Empiricist methods (questionnaire as sampling method) as quantitative approach for data collecting because of the high confidence interval regarding questionnaire results and because of development of ISD and scientific research methodologies conducted form literature survey as interpretative research methods.

**Relation To Organisational Learning**

As mentioned before, organisation cannot learn as individuals but is still possible to apply some learning mechanisms to organisational learning through better understanding of human learning. Similarly it is not possible that an artificial intelligence (AI) artefacts functions on the same way as human but some findings from AI research can be used to improve organisational learning. In this part of the essay the intelligent agents from AI are used, described by Russell and Norving (2010, p.34-61) and multiple agent systems (MAS) is recommended for development of IS supporting organisational learning.

Informational systems for organisational learning should be based on multi agent systems i.e. based on many autonomous computer agent systems in order to achieve double-loop learning and capability to “learn to learn”. Multi agent systems (MAS) are effective way to increase capabilities to change. The MAS is suitable for “open or high dynamic, uncertain or complex environments” (Russell and Norving, 2010, p.226). It is suitable for situations when centralised systems are not capable to cope with the problem solving e.g. distributed database systems. It is also very suitable for complementing and upgrading legacy systems (Russell and Norving, 2010, p.227).
Regarding already mentioned changes within organization that are results of organizational inquiry proceed “the mismatch between expected and actual results” (Argyris & Shôn, 1966, p.17) the following agents correspond for each of changes are recommended:

a) Model-based reflex agents that combine current precept with old internal state in order to update current state description,

b) Goals based agents that by searching and planning try to optimally achieve the goal,

c) Learning agents that modify their behaviour throughout the feedback used “learning elements” making improvements that “performance element” use in order to select an action.

d) Learning agents- same as c),
e) Learning agents- same as c),
f) Utility based agents that by performance measure try to “maximizes expected utility”,
g) Learning agents- same as c) and
h) Learning agents- same as c).

By interaction of those agents i.e. multiple-agents systems, the efficient organisational learning can be achieved. That means that the organisation would be able to achieve beside double-loop learning, sustainability too because multiple- agent systems are endurable and independent hence can be easily replaced or updated without influencing the functionality of the entire multiple-agents system.

In order to achieve continuous learning it is important that the organisation uses CSCW on four levels:

- internally between groups within the organisation,
- internally within each group members,
- externally between other organisations and
- externally between other partners.

For internally interaction within each group members CSCW should be supported; with the peer-to-peer networking used in order to develop share meanings and group culture. For internal interaction between groups within organisation; with a centralised system supporting knowledge management (KM) and competence management (CM) securing that seldom used knowledge still will be available. For external interaction; with other organisations, with service oriented architecture (SOA). External interaction between other non-regular partners e.g. online customers CSCW should be supported with semantic web.

The very common discussion under last three decades has been organisational capabilities of self-organizing (Morgan, 2006, p.72). Wiener points out the importance of feedbacks as one of the essentials for controlling the system behaviour as common characteristics to human behaviour (Wiener, 1954, p.26) thus for self-organising of organisations. E.g., while it just seems to us that we move our hand towards the object we want to grip in a straight line it was proven that that is not case and that movement of our hand is unconsciously continuously corrected in its way to the object by eliminating the negative feedback (Morgan, 2006, p.83) i.e. when we use our hands to do something we are unconsciously continuously correcting their movement.

While feedback is important it is not sufficient for self-organising. As mentioned before, the systems as thermostat can be enabled to modify its properties with help of feedback but just according to predefined norms and values, with the single loop learning mechanism but it can not change those predefined norms and values by self regulation as it would if it would be possible to enable it to perform double loop learning i.e. to be able learn to learn
That implies that the main characteristic of self-organizing organisation is capability to learn to learn therefore organizational learning. In order to establish such capability Morgan suggest the following guidelines (Morgan, 2006, p.87-97):”

- Scanning and Anticipation of Environmental change,
- Challenging Operation Norms and Assumptions and
- Encouraging “Emerging” Organisation.”

Scanning and Anticipation of Environmental change advocates understanding and acceptance of the environmental changes as norms, while Challenging Operation Norms and Assumptions openness for revaluing and accepting of new norms and values. Encouraging Emergency Organisation assumes human intelligence as not determinate and that as decentralized emergent phenomenon (Morgan, 2006, p.87-97)

All of those three guidelines as well as MAS have in common that they attach grate importance to change and therefore the most suitable paradigm from EFPISD for developing IS that would support organisational learning (organisational learning IS) are those that assume change as a characteristic of societies and organisations. That means the most suitable is neohumanist paradigm used for developing Singerian inquiring system that supports change and reduces the error approximation similar to reducing the negative feedback. In order to provide effective solution for knowledge transfer system should be supported by Hegelian inquiry system (Hegelian storyteller (Churchman, 1971, p.178)).

It is very common that members of an organisation are resisting organisational changes because they view them as intrusive even when it is necessary for organisation to change. Therefore such resistance to change has to be considered before the changes are going to be implemented (Churchman, 1971, p.14) and methodologies for reducing such resistance as design PD participatory (Flensburg, 1984, p.1) should be used.

Participatory design (PD) is information systems design approach in which interests of end-users of information systems (IS) have one of the highest priorities in development of IS. PD assumes that users of IS are the most competent to distinguish what is most urgent and necessary to do in order to improve their skills. PD assumes that automatization is just a complement to already existing human skills in organisation and not replacement (Schuler, Namioka, 1993, p. xi) and hence advocates that in order to reduce “resistance against change” is important to understand the consequences of ICT implementation for organisation and therefore is important to put a high importance on human skills development in organisation. (Schuler, Namioka, 1993, p.99). PD is present both in neohumanist paradigm and Singerian inquiring system.

In order to relate enhance paradigm of IS to network societies it is important to the use these learning organisations fundamentals for network societies too because network societies are organisations as well.

**Relation To Network Societies**

The biggest problem of networks as well as Internet is their vulnerability for intentional attacks and long recovering time after such attacks (Cohen, et al., 2000, p.1-3). Hence it is important to insure that network societies have stable and enduring network resistant to intentional attacks. For such purpose the peer-to-peer (P2P ) networking should be used because every node in such network acts both as a server and client. The peer-to-peer networking is very resistant for intentional attack what is the one of the reasons that peer-to-peer networking is suitable for developing sustainable network societies. P2P is the best because it offers the best way for culture development in network societies and not just for its endurance as e.g. the cloud computing does. The nodes can include the cloud computing as e.g backup system but an entire network society cannot be based on the cloud computing. Centralized network functioning as a library would have backup system and the cloud computing would fit for that purpose well because it does mostly require information transfer and not knowledge transfer. For knowledge transfer it is important to have P2P networking in order to insure that each user self decides and emphasis what is important to share with other users in order to develop shared meanings what is essential for developing a culture. It is similar to language. While the cloud
computing can be presented as a dictionary metaphor, P2P networking can be presented with a spoken language metaphor. Languages consist of the words each individual use in communication and those words that are common are one part of the organizational knowledge and culture. The words in dictionaries are not knowledge and neither culture but just information.

The same collaboration, interaction and learning mechanism can be applied to network societies as it has been applied for learning organisations because network societies are learning organisations with emphases on distributed interaction where distributed synchronies and asynchronies interacting are more in use than in traditional organisations and thus more attention should be given to that kind of interaction. Peer-to-peer combined with certain centralised system functioning as a library is necessary in order to insure that rarely used information will be is available.

As mentioned before “holonomic brain theory” is just partly correct but brain metaphor still can be used because brain has such capabilities and hologram metaphor is in this research and essay used because Morgan (2006) gives very interesting description of self-organizing organisation referring to it.

In this essay holographic is exclusively regarding to capability to recover information from parts of network system. According to Flood and Jackson, throughout “getting the whole into parts” (1991, p.11) we can mange to recover systems thus network systems from very small of their units.

Holographic design is characterised by: “
1. **Building whole into a parts,**
   - through shared vision, core values, aspirations etc,
   - ”network intelligence” i.e. distributed information systems that can be integrated in order to support organisational memory,
   - ”holographic structure” that avoids centralized growth organisation and supports distribution of organisation in optimal sustainable parts but with occasional specialisation of its processes i.e. ”holographic reproduction” and
   - ”holistic team and diversified roles ” of teams and members of teams that in large centralized organizations are preformed by different apartments.

2. **Importance of redundancy** that provides opportunity for the multiple source of initiatives and for parallel processing.

3. **Requisite variety** presenting the optimal level of redundancy in direct relation to organisational environment,

4. **Minimum specification used** to avoid over-control that would decrease the level of redundancy and

5. **Learning to learn** ability based on double loop learning mechanism.”

(Morgan, 2006, p.100-117).

One of the most important characteristics of network societies is its capacity of endurance (persistence) and information and knowledge recoverability that is achieved throughout its distribution. That is very important because it is not only information that has to be transferred between organisations and between networks societies but knowledge too and that is essential as for example for CSCW or service oriented architecture SOA.

The most important fact we should be aware of is that data self it is not enough to achieve brain capabilities of organisations and network societies and neither self-preservation of data on multiple network servers. That what is most important is knowledge transformation and it is similar to the transfer of the culture and shared meanings and thus to managing organisational culture. Effective knowledge transformation can be achieved through storytelling (Flensburg, 2009, p.38) and in case of network societies important is to do it through other ways of communication too as synchronous and asynchronous distributed by using presentation in
form of streaming files, images, texts i.e. multimedia productions. Multimedia productions are especially important for network societies because communication is more and more established throughout CSCW tolls supported with multimedia (Borghoff & Schlichter, 2000, p.90-91).

Peer-to-peer (P2P) network’s endurance is essential for knowledge transfer and thus for organisational culture development. Culture is based on share meanings and such meanings should be distributed over a P2P network supported by one centralised network, which would function as a library in order to decrease vulnerability for knowledge and information losses respectively. For such purpose network information systems (NIS) that would support network societies should be based on social relativist paradigm used for developing Kantian inquiring system build on a top of organisational learning IS (OLIS) in order to insure knowledge transfer (Hegelian storyteller (Churchman, 1971, p.178) and because as already mentioned, network societies are organisations too that need to cope with continuous changes and contingency as well as in order to decrease resistance to change common for the cultural phenomenon as network societies. Social relativist paradigm and Kantian inquiring system should be used because of their view of organisation as a network and culture phenomenon respectively, views essential for development of sustainable network societies. Idealized design is approach is recommend as very suitable problem solving approach for total destruction scenarios caused by sever intentional attacks when systems need to be developed from scratch.

Questionnaire results

The questionnaire was sent to 500 persons that were involved in university teaching or research on postgraduate level relevant to social informatics mostly in EU. Twenty two responses were received what makes its confidence interval with confidence limit 95% (95CI) of ± 20.45 (Russell, 2006, 182-184) (Fig.7) and that means if the answer on each of the question would be received from all relevant population it could appear 20.45% more or less often.

![Fig.7 Confidence interval](image)

Results of the questionnaire are presented in diagram below (Fig.8). Columns of the diagram with the nuances of orange present odd question while those with the blue nuances even one. First row of column presents the level of answers with label “a” and the second with labels “b” (see appendix D). As already mentioned answers labelled “a” present the questions regarding stability and objective dichotomies, and those with label “b” change and subjective dichotomies.
Questions are presented as choice of dichotomies labelled as “a)” or “b)”’. Questions numbered with odd numbers answered with “a” solution present the questions regarding integrationist (stability) dichotomies while odd numbered questions answered with “b” present coercion (change). The even numbered questions answered with “a” solutions present the questions regarding objective dichotomies while even numbered questions answered with “b” present subjective dichotomies.

As it can be observed from diagram above (Fig.8) answers presenting solution “a)” on 6th, 7th and 8th question have higher value. That shows that most of the interviewed persons respectively, believe that:

- 6th Society can be studied by methods from natural science,
- 7th Every element in a society has function, i.e., renders a contribution to its maintain a system
- 8th Behaviour of individual in society is completely determined by situations or environment.

While 7th are typical characteristic for positivist scientific research but is in some extend presented in interpretativist too, the 6th and 8th question are strongly positivist assumptions and is not preferred for research in social science and thus social informatics.

The remaining questions are in manner of interpretative research methodologies and are recommended for research in social science and thus social informatics. In case of 6th and 8th questions 57.69% respective 57.14% of interviewed persons supported positivist assumption while in case of 7th question 75%. That indicates that universities still have quite strong positivistic view especially regarding the social reality and deterministic understanding of individual free will.
That implies that positivist paradigms was still quite strongly presented in research methodologies at those universities or at least in research methodologies of those interviewed persons but as it is obvious (Fig. 10), on lower extend than interpretative research methodologies as social relativists and neohumanists. That indicates that on the most of universities that offered degree in social informatics the interpretative research methodologies for studying were more used then positivist what was expected.

It is important to be aware that Fig. 1 explicitly presents just the relation regarding the objective v. subjective dichotomy and not integration/coercion (stability/change i.e. order/conflict) because the last is not relevant for the empirical research.
Discussion

As already mentioned there exist a misinterpretation that Leibniz only had mechanical view of the world he adopted from Descartes but I would argue that he had organic view too. It would be also interesting to discuss the if there is reasons to establish dichotomy organismic/organic and I would argue that organismic metaphor is concerned with holistic while organic with reductionist aspects of systems similar to mechanistic view. It would be also interesting to discuss how could metaphors of organisation be associated to suggestion I have given for relation of Boulding’s classification of systems to Porphyry's tree table below (Table 4).

<table>
<thead>
<tr>
<th>Porphyry's tree</th>
<th>Boulding's Classification of Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance</td>
<td>Body</td>
</tr>
<tr>
<td>material:</td>
<td>Body</td>
</tr>
<tr>
<td>immaterial:</td>
<td>Energy</td>
</tr>
<tr>
<td>Body</td>
<td>Living</td>
</tr>
<tr>
<td>animate:</td>
<td>Structures, Frameworks, Clock works, Control mechanism</td>
</tr>
<tr>
<td>inanimate:</td>
<td>Structures, Frameworks, Clock works, Control mechanism</td>
</tr>
<tr>
<td>Living</td>
<td>Animal</td>
</tr>
<tr>
<td>sensitive:</td>
<td>Animal</td>
</tr>
<tr>
<td>insensitive:</td>
<td>Open systems, Lower organisms</td>
</tr>
<tr>
<td>Animal</td>
<td>Human</td>
</tr>
<tr>
<td>rational:</td>
<td>Human</td>
</tr>
<tr>
<td>irrational:</td>
<td>Animals</td>
</tr>
<tr>
<td>Human</td>
<td>Human Beings</td>
</tr>
<tr>
<td>individual:</td>
<td>Human Beings</td>
</tr>
<tr>
<td>group:</td>
<td>Socio/cultural systems, Transcendental systems</td>
</tr>
</tbody>
</table>

Table 4. Boulding’s Classification of Systems in relation to Porphyry's tree

On other hand it is important to stress the importance of correct understanding of metaphorical conceptions of the social reality and continuously stress that technology and system development thus ICT and IS too, is not human made replacement of himself but the complement. In order to clarify the further development of ICT and IS it would be very important to prove if knowledge transfer can be achieved between ICTs as it is still believed of many ICT researcher especially those from called “hard AI”. The following statement by Churchman similar to Kant’s already mentioned above, stress the importance of correct understanding of human made artefacts teleological aspects what this thesis was partially about too:

"No system can ever be designed that will produce a better art, science, religion, or politics than that created by some men alone. This answer is appealing on a number of counts. It is appealing because we are all afraid of losing our dignity as men; we are afraid that system will "take over" and do all better that a lonely man can do. It is appealing because we want us to remain free; if a system is design to perform better than we can, it can legitimately tell us what to do. The answer is also appealing because it is almost, if not altogether, a tautology. What do we mean by a "creative art"? If we say an action is creative only if it cannot be analyzed or understood then clearly no system can be designed to create, for design always implies both analysis and understanding."

(Churchman, 1971, p.4)

One of the most essential aspects of IS is a communication and knowledge transfer. While there are similarities between interpersonal communication; and data and information transfer between ICTs regarding the control of entropy by the feedback (Wiener, 1954, p.26) the differences are enormous regarding knowledge transfer. Information transfer is a part of knowledge transfer but information transfer solely is not sufficient for communications without the knowledge transfer. Information transfer between ICTs is ICT interaction and not communication. Therefore it should be discussed if communication and knowledge transfer can happen only between living beings in order to avoid wasting time and resources and avoid causing stress on environment.
It would also be interesting to discuss how two paradigms of IS, behaviour science and design science, described in Hevner’s article "Design Science in Information systems Research" (Hevner, March, Park and Ram, 2004) are related to four paradigms of ISD suggested by Hirscheim.

Design science agenda is supposed to be creation of theoretical foundations for a design practice (Walls et al., 2004) and is defined as “design of system”. In order to achieve concrete goals with design (Churchman, 1971, Walls, 1992) the entities and relationships between them are constructed by “building and evaluating: constructs (“concepts with which to … characterized phenomenon”), models (that “describe task, situation or artefact”), methods (“ways of performing goal directed activities”) and instantiations (‘physical implementations intended to perform certain tasks’)” (Walls et al., 2004) (see Fig.11).

The three design science research approaches exist complementing each other depending of their main focus of research, thus with focus on artefacts, on development of design science theories and on development of designing methodologies. The first two mentioned approaches are based on behavioural and design science while the third on critical rationalism paradigm. Carlsson states (2011, p.110) that the IS design science research is mostly based "on positivism, traditional realism and pragmatism” rather then on critical realism. Critical realism assumes that “reality exists independently of our cognition” i.e. assumes that reality is objective but facts and observations about e.g. the social reality heuristic, interpretative and thus subjective. Critical realism advocates “objective ontology and subjective epistemology”. (Carlsson et all. 2011, p.110)

As Alfred Kuhn in his book "The logic of social systems" states "Holist, reductionist and functionalist analyse are thus different views from the same level. There is no point in arguing which is "better": all are necessary for a balanced view" (Kuhn, 1974., p.12). Therefore it is important to understand that complementarism as e.g. in TSI, is one of the appropriate approaches for choice of ISD methodologies but still it is remained to discuss which methodology is most suitable for specific situation. Since it is very time requesting and difficult, if possible, to identify all system requirements the hard system development is not suitable for the continues changing of system requirements and alternative ISDM are preferred as it is e.g. RAD. (Avison, Fizegerald, 2003, p.94)

There is no easy or any other ISD method that is suitable for every situation and it would be interesting to discuss situations each ISDM is most suitable for. Dawson (2005, p.131) suggests to categorised fitness of ISDM regarding to risk in system performance and time schedule. According to him for situation when risk for performance are low but time schedule is tight conventional methods are most suitable while for situation
when requirement are evident but complexity is high incremental methods should be used. For situations when system requirements are not evident evolutionary methods are proper solutions.

As it is evident from table 3 and figure 6 three of paradigms have been associated with most of ideas of at least one representatives of those five philosophers presented on figure whose ideas are more or less in agreement with certain paradigm. Radical structuralism was not associated with any of them particularly and further research should be done in order to find appropriate inquiring system for that paradigm as well. I would argue that it should be based on the ideas similar to participatory design PD because PD advocates: better cooperation between managers and end-users (Kensing, Blomberg, 1998, p.172), interest of end-user as one of the highest priorities, end-user participation in ISD, automatization as just a complement to already existing human skills in organisation and not its replacement (Schuler, Namioka, 1993, p. xi).

Empiricist and rationalist as it was mentioned, share the same idea i.e. that is not possible to observe the hole reality and at the same time be included in it but Leibniz claims that it is only possible to comprehend the hole reality with a priori knowledge and not a posteriori knowledge i.e. observation while Locke claims that observation, empirical data and induction with some degree of certainty is the only way to comprehend reality in any extend. Does not that mean that Leibniz claim that is possible for an individual to comprehend the hole reality and Locke denies?

One other issue interesting for discussion is Singer assumption regarding concept of ideal. As already mentioned for Singer ideal is eternal goal that each human activity should continuously try to approach in order to achieve better and better outcome i.e. progress (Singer, 1927, p.280-282) and such process is called for experimentalism (instrumental idealism or nonphenomenology) (Alderson, 2006, p.311) Experimentalism advocates that ideal can never be fulfilled but only approached and that implies that Singer advocates the changes. Regarding this statement I got following very interesting comment for Per Flensburg, my supervisor during this research “Yes, bit not radical changes! Only incremental changes. But what about radical changes, such as for instance the string model instead of the standard model in quantum physics?” and it would be interesting to discuss his comment in relation to his research result in which he found that IS from scratch is not economical anymore, and I take this as opportunity to thank to Per for very constructive and interesting peer reviews. I would argue that Ackhoff’s idealized design should be used, suitable for radical changes; designing from scratch and total destruction scenarios and since such scientific paradigm shifts are sometimes mistaken for that!

Conclusion

The theory of ISD proposed by Hirschheim’s and Klein’s as well as the Churchman’s theory of ISD have been synthesised and related to learning organisations and to network societies as my main contribution in this master thesis research. Because those both approaches are based on the epistemological assumptions of ISD it has been possible to relate them to each other. Throughout that synthesis it was interesting to find out that both empiricist and rationalist state that is not possible to observe the hole reality and at the same time be included in it but that they have different methodologies for generating knowledge about reality.

While development of IS from scratch is not economical anymore (Flensburg, 2008, p.2) if not necessary, it is very important to put more attention on improvement of interactions between legacy systems and new ICT because development of Internet has established opportunities for development of networks societies that are largely depended on communication and knowledge transfer. Therefore, it is important to understand ontological and epistemological aspects of knowledge generation because it is not only information that has to be transferred between organisations but knowledge too. Knowledge transfer is essential for instance for network based business, CSCW, SOA, network societies and organisational learning.
The most important characteristics of organisational learning and thus learning organisations are strategy for supporting changes and reducing resistance to changes and consequently learning to learn. Argyris draws an analogy between a thermostat and the single loop learning explaining that if a thermostat would be able to accomplish double loop learning if it would be able to rethink and modified its settings by itself (Argyris, 1999, p.68). As we have seen organization learning can be also associated with some of brain functions and that means that some characteristics of brain functions can also be applied to the organisational theory and thus to learning organisations and organisational learning and consequently to network societies.

The most important characteristic of network societies is knowledge recovering, and not only information recovering. That is achieved through its distributive capacity achieved throughout the peer-to-peer networking. While is necessary to have one centralized system functioning as a library in order to make rarely used information available and to reduce information losses such system is very vulnerable for breakdowns, and thus is important to understand that network societies and learning organisations must base their information systems on “peer to peer” networking and not solely on centralized one.

The brain metaphors of organisational learning and network societies should be taken as something that is just partly realizable but still desirable. Every metaphor has its advantages and disadvantages and the total system intervention (TSI) is recommended in order to emphasize the importance of complementarism in choices of metaphors and thus methodologies. Similarly multi-agent systems are used intending to suggest the way of achieving the double-loop learning mechanism and systems suitable for changes. Participative design is recommended as methodology for reducing the “resistance for change”. It is advised to use CSCW or SOA for information and knowledge transfer within organisations and networks societies. The peer-to-peer networking is suggested for development of share meanings and organisation culture as well as for sustainability of network societies and endurance of information and knowledge losses.

In order to reduce resistance to change and to increase knowledge transfer in network societies, network information systems (NIS) supported by organisational learning IS (OLIS) is recommended.

The theories of evidence should be used complementarily e.g. a theoretical research for natural science fields should use rationalist research methods complemented with empirical and interpretative research approaches and an experimental research for science fields, empirical complemented with rationalist and interpretative research methods. Similarly a theoretical research for social science fields should use interpretative research methods supported with more rationalist and less empirical research methods as e.g. for social informatics and inverse i.e. interpretative research methods supported with less rationalist and more empirical research methods for an applied science as e.g. for the healthcare science.

My contribution in this master thesis has been the synthesis of Churchman and Hirschheim approaches to ISD. I have also given the solution for achieving the double-loop learning through the multi-agent system and solution for developing sustainable network societies through the peer-to-peer networking combined with a centralised one. I have also explicitly explained the differences between monism (holism) and pluralism referring to Leibniz and Locke’s epistemology. Singer’s explanation of insufficiency of either rationalist or interpretative approaches for explanation of natural laws has been revised and used to generate Singerian epistemology (Se) and this is also one of my contributions in this research. I also suggested the complementary use of the rationalist, empirical and interpretative research methodologies for research in theoretical, experimental, applied and social science fields, CRSM.

The empirical research was also conducted and it appeared that with exception on 6th, 7th and 8th question all other answer on questions were supporting interpretativist research methodologies for studying societies. In case of 6th and 8th question, 57.69% respective 57.14% interviewed persons were supporting positivist assumption while in case of 7th question, which is not typical for a positivist scientific research but is present in it, 75%. That indicates that on the most of universities offering degree in social informatics proper research methodologies for studying societies were used as it was expected to be.
Further research

Certain revision of Hirschheims social relativism and neohumanism (see Fig.9) should be performed because those two terms are not enough descriptive and they are not widely in use and that makes them difficult to comprehend and apply. The revision is expected to prove that they can be replaced with more exact and more extend paradigm i.e. cultural relativism respective social constructivism. The term cultural relativism is used more often than social relativism and they are synonyms presenting the same paradigm. Instead of radical humanism that has not explicit theory of epistemology, social constructivism should be used since it is related to socio-cognitive conflict theory of Piaget and socio-cultural theory of Vygotsky thus to social constructivist theory of learning (Zheng, Li, Zheng, in Wu, 2011, p.395).

It would be interesting to do research regarding the relation of questionnaire results to ISD (EFPISD) regarding order/conflict dichotomy too.

The further research should be also done regarding the relation of the organisation theories: scientific management and bureaucracy, human relation and contingency theory, to EFPISD. More precise the further research regarding the relation of the organisation theories throughout Lockean and Leibnizian, Kantian and Hegelian inquiring systems respectively, to functionalism, social relativism and neohumanism; and consequently to EFPISD, regarding their relation throughout their organisational structure, organisational culture and organisational change.
References


Aggestam L., 2006. Learning Organization or Knowledge Management-Which came first, the chicken or Egg? Information Technology and Control, Vol.35, No.3A.


Kant I., 2003. *Great books of the western world; 42. The critique of pure reason; The critique of practical reason and other ethical treatises; The critique of judgement*. Encyclopaedia Britannica, Inc.


Appendixes

Appendix A: Questionnaire

With which one of the following two dichotomies about the societies you agree more with a) or b) (alternatively you can answer both a) and b) with number between 1-10 after each of them presenting the level that each dichotomy characterizes societies):

1. Stability/Change
   a) Every society is a relatively persistent, stable structure of elements.
   b) Every society is at every point subject to processes of change; social change is ubiquitous.

Answer:

2. Objective/Subjective
   a) Societies can be objectively studied
   b) Understanding of societies is subjective

Answer:

3. Integrity/Conflict
   a) Every society is a well integrated structure of elements.
   b) Every society displays at every point disensus and conflict; social conflict is ubiquitous.

Answer:

4. Realist/Nominalist
   a) Society exists out of human consciousness
   b) Society exists from perspective of actors and individual consciousness and subjectivity

Answer:

5. Consensus/Coercion
   a) Every functioning social structure is based on a consensus of values among its members.
   b) Every society is based in the coercion of some of its members by others.

Answer:

6. Positivist/Antipositivist
   a) Society can be studied by methods from natural science
   b) Society cannot be studied by methods from natural science

Answer:

7. Functional coordination/Disintegration
   a) Every element in a society has function, i.e., renders a contribution to its maintain as a system.
   b) Every element in a society renders a contribution to disintegration and change.

Answer:

8. Determinist/Voluntarist
   a) Behaviour of individual in society is completely determined by situations or environment
   b) Behaviour of individual in society is autonomous and free will and free-choice

Answer:

9. Organism/Network
   a) Society has mechanical or biological structure
   b) Society has network structure

Answer:

10. Nomothetic/Ideographic
    a) Society can be understood by observation and questionnaires
    b) Society can be understood only by being involved into society that of studied

Answer:
Appendix B: Answers on questionnaire in relation to each sociological paradigm

<table>
<thead>
<tr>
<th><strong>Functionalism</strong></th>
<th><strong>Social Relativism</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Stability/Change</strong>&lt;br&gt;a) Every society is a relatively persistent, stable structure of elements.</td>
<td>1. <strong>Stability/Change</strong>&lt;br&gt;a) Every society is a relatively persistent, stable structure of elements.</td>
</tr>
<tr>
<td>2. <strong>Objective/Subjective</strong>&lt;br&gt;a) Societies can be objectively studied</td>
<td>2. <strong>Objective/Subjective</strong>&lt;br&gt;b) Understanding of societies is subjective</td>
</tr>
<tr>
<td>3. <strong>Integrity/Conflict</strong>&lt;br&gt;a) Every society is a well integrated structure of elements.</td>
<td>3. <strong>Integrity/Conflict</strong>&lt;br&gt;a) Every society is a well integrated structure of elements.</td>
</tr>
<tr>
<td>4. <strong>Realist/Nominalist</strong>&lt;br&gt;a) Society exists out of human consciousness</td>
<td>4. <strong>Realist/Nominalist</strong>&lt;br&gt;b) Society exists from perspective of actors and individual consciousness and subjectivity</td>
</tr>
<tr>
<td>5. <strong>Consensus/Coercion</strong>&lt;br&gt;a) Every functioning social structure is based on consensus of values among its members.</td>
<td>5. <strong>Consensus/Coercion</strong>&lt;br&gt;a) Every functioning social structure is based on consensus of values among its members.</td>
</tr>
<tr>
<td>6. <strong>Positivist/Antipositivist</strong>&lt;br&gt;a) Society can be studied by methods from natural science</td>
<td>6. <strong>Positivist/Antipositivist</strong>&lt;br&gt;b) Society cannot be studied by methods from natural science</td>
</tr>
<tr>
<td>7. <strong>Functional coordination/Disintegration</strong>&lt;br&gt;a) Every element in a society has function, i.e. renders a contribution to its maintain as a system.</td>
<td>7. <strong>Functional coordination/Disintegration</strong>&lt;br&gt;a) Every element in a society has function, i.e. renders a contribution to its maintain as a system.</td>
</tr>
<tr>
<td>8. <strong>Determinist/Voluntarist</strong>&lt;br&gt;a) Behaviour of individual in society is completely determined by situations or environment</td>
<td>8. <strong>Determinist/Voluntarist</strong>&lt;br&gt;b) Behaviour of individual in society is autonomous and free will and free-choice</td>
</tr>
<tr>
<td>9. <strong>Organism/Network</strong>&lt;br&gt;a) Society has mechanical or biological structure</td>
<td>9. <strong>Organism/Network</strong>&lt;br&gt;a) Society has mechanical or biological structure</td>
</tr>
<tr>
<td>10. <strong>Nomothetic/Ideographic</strong>&lt;br&gt;a) Society can be understood by observation</td>
<td>10. <strong>Nomothetic/Ideographic</strong>&lt;br&gt;b) Society can be understood only by being involved into society that of studied</td>
</tr>
<tr>
<td>Radical Structuralism</td>
<td>Neohumanism</td>
</tr>
<tr>
<td>----------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>b) Every society is at every point subject to processes</td>
<td>b) Every society is at every point subject to</td>
</tr>
<tr>
<td>of change; social change is ubiquitous.</td>
<td>processes of change; social change is ubiquitous.</td>
</tr>
<tr>
<td>2. Objective/Subjective</td>
<td>2. Objective/Subjective</td>
</tr>
<tr>
<td>a) Societies can be objectively studied</td>
<td>b) Understanding of societies is subjective</td>
</tr>
<tr>
<td>3. Integrity/Conflict</td>
<td>3. Integrity/Conflict</td>
</tr>
<tr>
<td>b) Every society displays at every point dissensus and</td>
<td>b) Every society displays at every point</td>
</tr>
<tr>
<td>conflict; social conflict is ubiquitous.</td>
<td>dissensus and conflict; social conflict is</td>
</tr>
<tr>
<td></td>
<td>ubiquitous.</td>
</tr>
<tr>
<td>4. Realist/Nominalist</td>
<td>4. Realist/Nominalist</td>
</tr>
<tr>
<td>a) society exists out of human consciousness</td>
<td>b) society exists from perspective of actors and</td>
</tr>
<tr>
<td></td>
<td>individual consciousness and subjectivity</td>
</tr>
<tr>
<td>b) Every society is based in the coercion of some of its</td>
<td>b) Every society is based in the coercion of</td>
</tr>
<tr>
<td>members by others.</td>
<td>some of its members by others.</td>
</tr>
<tr>
<td>6. Positivist/Antipositivist</td>
<td>6. Positivist/Antipositivist</td>
</tr>
<tr>
<td>a) Society can be studied by methods from natural</td>
<td>b) Society cannot be studied by methods from</td>
</tr>
<tr>
<td>science</td>
<td>natural science</td>
</tr>
<tr>
<td>b) Every element in a society renders a contribution to</td>
<td>b) Every element in a society renders a</td>
</tr>
<tr>
<td>disintegration and change.</td>
<td>contribution to disintegration and change.</td>
</tr>
<tr>
<td>a) Behaviour of individual in society is completely</td>
<td>b) Behaviour of individual in society is</td>
</tr>
<tr>
<td>determined by situations or environment</td>
<td>autonomous free will and free-choice</td>
</tr>
<tr>
<td>b) Society has network structure</td>
<td>b) Society has network structure</td>
</tr>
<tr>
<td>a) Society can be understood by observation and</td>
<td>b) Society can be understood only by being</td>
</tr>
<tr>
<td>questionnaires</td>
<td>involved into society that of studied</td>
</tr>
</tbody>
</table>
## Appendix C: View of each philosophers related to questionnaire

<table>
<thead>
<tr>
<th>1) Stability/Change</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Every society is a relatively persistent, stable structure of elements.</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>b) Every society is at every point subject to processes of change; social change is ubiquitous.</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>2) Objective/Subjective</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Societies can be objectively studied</td>
<td>a</td>
<td>a</td>
<td></td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>b) Understanding of societies is subjective</td>
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<table>
<thead>
<tr>
<th>3) Integrity/Conflict</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Every society is a well integrated structure of elements.</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>b) Every society displays at every point dissensus and conflict; social conflict is ubiquitous.</td>
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<table>
<thead>
<tr>
<th>4) Realist/Nominalist</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
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<tbody>
<tr>
<td>a) Society exists out of human consciousness</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>b) Society exists from perspective of actors and individual consciousness and subjectivity</td>
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<thead>
<tr>
<th>5) Consensus/Coercion</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Every functioning social structure is based on a consensus of values among its members.</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>a</td>
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<tr>
<td>b) Every society is based in the coercion of some of its members by others.</td>
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<table>
<thead>
<tr>
<th>6) Positivist/Antipositivist</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Society can be studied by methods from natural science</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>b) Society cannot be studied by methods from natural science</td>
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<thead>
<tr>
<th>7) Functional coordination/Disintegration</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Every element in a society has function, i.e., renders a contribution to its maintain as a system.</td>
<td>a</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>a</td>
</tr>
<tr>
<td>b) Every element in a society renders a contribution to disintegration and change.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8) Determinist/Voluntarist</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Behaviour of individual in society is completely determined by situations environment</td>
<td>b</td>
<td>a</td>
<td>b</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>b) Behaviour of individual in society is autonomous and free will and free-choice</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9) Organism/Network</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Society has mechanical or biological structure</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td>b) Society has network structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10) Nomothetic/Ideographic</th>
<th>Locke</th>
<th>Leibniz</th>
<th>Kant</th>
<th>Hegel</th>
<th>Singer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Society can be understood by observation and questionnaires</td>
<td>a</td>
<td>a</td>
<td>b</td>
<td>b</td>
<td>b</td>
</tr>
<tr>
<td>b) Society can be understood only by being involved into society that studied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Questions are presented as choice of dichotomies labelled as “a” or “b”. Even numbered questions answered with “a” solution present the questions regarding integrationist (stability) dichotomies while even numbered questions answered with “b” present coercion (change). Odd numbered question answered with “a” solutions present the questions regarding objective dichotomies while odd questions answered with “b” present subjective dichotomies. (see appendix A).

<table>
<thead>
<tr>
<th>Integration</th>
<th>Objective</th>
<th>Subjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functionalism</td>
<td>1) Locke; Leibniz</td>
<td>1) Kant</td>
</tr>
<tr>
<td></td>
<td>2) Locke; Leibniz</td>
<td>2) Kant; Singer</td>
</tr>
<tr>
<td></td>
<td>3) Locke; Leibniz</td>
<td>3) Kant</td>
</tr>
<tr>
<td></td>
<td>4) Locke; Leibniz; Singer</td>
<td>4) Kant</td>
</tr>
<tr>
<td></td>
<td>5) Locke; Leibniz</td>
<td>5) Kant; Singer</td>
</tr>
<tr>
<td></td>
<td>6) Locke; Leibniz</td>
<td>6) Kant; Singer</td>
</tr>
<tr>
<td></td>
<td>7) Locke; Leibniz</td>
<td>7) Kant; Locke; Singer</td>
</tr>
<tr>
<td></td>
<td>8) Leibniz</td>
<td>8) Kant</td>
</tr>
<tr>
<td></td>
<td>9) Locke; Singer</td>
<td>9) Kant</td>
</tr>
<tr>
<td></td>
<td>10) Locke, Leibniz</td>
<td>10) Kant; Singer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change</th>
<th>Objective</th>
<th>Subjective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radical Structuralism</td>
<td>1) -</td>
<td>1) Hegel; Singer</td>
</tr>
<tr>
<td></td>
<td>2) -</td>
<td>2) Hegel</td>
</tr>
<tr>
<td></td>
<td>3) -</td>
<td>3) Hegel; Singer</td>
</tr>
<tr>
<td></td>
<td>4) -</td>
<td>4) Hegel</td>
</tr>
<tr>
<td></td>
<td>5) -</td>
<td>5) Hegel</td>
</tr>
<tr>
<td></td>
<td>6) -</td>
<td>6) Hegel;</td>
</tr>
<tr>
<td></td>
<td>7) -</td>
<td>7) Hegel</td>
</tr>
<tr>
<td></td>
<td>8) Hegel; Singer</td>
<td>8) -</td>
</tr>
<tr>
<td></td>
<td>9) Hegel</td>
<td>9) -</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10) Hegel;</td>
</tr>
</tbody>
</table>
Appendix D: Responses on questionnaire

The numbers in brackets are multiple answers within 1-10 scale and if they are greyed that means that they are not included in statistic because the other solution has a larger value. For example the first value under column “a” is (3-5) where 3 presents questionnaire number and 5 presents value for solution “a” and is in grey colour because the same answer is presented under column “b” as (3-8) but with value 8. That means that the person thinks that value 5 can be associated with the first question regarding stability in societies and value 8 regarding change, in scale 1 to 10.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Stability/Change</td>
<td></td>
</tr>
<tr>
<td>a) Every society is a relatively persistent, stable structure of elements.</td>
<td>(3-5), (4-5), 8, 10, (11-8), 15, 16, (17-2), 18, (22-4)</td>
</tr>
<tr>
<td>b) Every society is at every point subject to processes of change; social is ubiquitous.</td>
<td>1, 2, (3-8), (4-5), (5-b), 6, 7, 9, 10, (11-2), 12, 13, 14, 8, 19, 20, 21, (22-10)</td>
</tr>
<tr>
<td>2) Objective/Subjective</td>
<td></td>
</tr>
<tr>
<td>a) Societies can be objectively studied</td>
<td>1, (3-6), (4-9), (5-3), 6, 8, 10, (11-9), 14, 16, (17-5), 18</td>
</tr>
<tr>
<td>b) Understanding of societies is subjective</td>
<td>2, (3-6), (4-1), (5-7), 7, 9, 10, (11-1), 12, 13, 15, (17-5), 19, 20, 21, 22</td>
</tr>
<tr>
<td>3) Integrity/Conflict</td>
<td></td>
</tr>
<tr>
<td>a) Every society is a well integrated structure of elements.</td>
<td>(3-3), (5-0), 7, 8, (11-7), (17-7), 18, (22-5)</td>
</tr>
<tr>
<td>b) Every society displays at every point disensus and conflict; social conflict is ubiquitous.</td>
<td>1, 2, (3-7), (4-b) (5-0), 9, (11-3), 12, 13, 14, 15, 16, (17-3), 18, 19, 20, 21, 22-9</td>
</tr>
<tr>
<td>4) Realist/Nominalist</td>
<td></td>
</tr>
<tr>
<td>a) society exists out of human consciousness</td>
<td>2, (3-3), (5-0), 6, 7, (8-6), 9, 10, (11-4), 14, 15, (17-6), 19, (22-2)</td>
</tr>
<tr>
<td>b) society exists from perspective of actors and individual consciousness and subjectivity</td>
<td>1, 2, (3-9), (4-b), (5-2), 7, (8-4), (11-6), 12, 13, 16, (17-4), 18, 19, 20, (22-9)</td>
</tr>
<tr>
<td>5) Consensus/Coercion</td>
<td></td>
</tr>
<tr>
<td>a) Every functioning social structure is based on a consensus of values among its members.</td>
<td>1, 2, (3-5), (4-7), 6, 7, 9, 10, (11-4), 12, 14, 15, 16, (17-5), 19, (21-3), (22-5)</td>
</tr>
<tr>
<td>b) Every society is based in the coercion of some of its members by others.</td>
<td>2, (3-5), (4-3), 8, (11-6), 12, 13, (17-5), 18, , 20, (21-7), (22-7)</td>
</tr>
<tr>
<td>6) Positivist/AntiPositivist</td>
<td></td>
</tr>
<tr>
<td>a) Society can be studied by methods from natural science</td>
<td>1, 2, (3-8), (4-a), (5-0), 7, (8-5), 9, 10, 10, (11-5), 12, 13, 14, 16, (17-8), 18, 19, 20, (21-6), (22-8)</td>
</tr>
<tr>
<td>b) Society cannot be studied by methods from natural science</td>
<td>2, (3-3), (5-0), (8-5), (11-5), (17-2), (21-4), (22-8)</td>
</tr>
<tr>
<td>7) Functional coordination/Disintegration</td>
<td></td>
</tr>
<tr>
<td>a) Every element in a society has function, i.e., renders a contribution to its maintain as a system.</td>
<td>1, 2, (3-2), (4-5), (5-5), 6, 7, (8-4), 9, 10, (11-6), 12, 14, 15, (17-6), 20, (21-5), (22-9)</td>
</tr>
<tr>
<td>b) Every element in a society renders a contribution to disintegration and change.</td>
<td>2, (3-4), (4-5), (5-5), 6, (8-6), (11-4), 12, 13, 16, (17-4), 18, 19, (21-5), (22-7)</td>
</tr>
<tr>
<td>8) Determinist/Voluntarist</td>
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</tr>
<tr>
<td>a) Behaviour of individual in society is completely determined by situations environment</td>
<td>(3-5), (4-7), (5-5), 7, 9, 10, (11-3), 15, (17-5), 21-6, (22-5)</td>
</tr>
<tr>
<td>b) Behaviour of individual in society is autonomous and free will and free-choice</td>
<td>1, 2, (3-7), (4-3), (5-5), 8, 10, (11-7), 12, 13, 14, 16, (17-5), 18, 19, 20, (21-4), (22-5)</td>
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<tr>
<td>9) Organism/Network</td>
<td></td>
</tr>
<tr>
<td>a) Society has mechanical or biological structure</td>
<td>1, 2, (3-9), (4-5), (5-0), 7, (8-8), 9, 10, (11-9), 12, 13, 15, (17-7), 19, 20, (22-7)</td>
</tr>
<tr>
<td>b) Society has network structure</td>
<td>(3-5), (4-7), (5-5), 7, 9, 10, (11-3), 15, (17-5), 21-6, (22-5)</td>
</tr>
<tr>
<td>10) Nomothetic/Ideographic</td>
<td></td>
</tr>
<tr>
<td>a) Society can be understood by observation and questionnaires</td>
<td>2, (3-8), (4-1), (5-0), 7, (8-8), 9, 10, (11-9), 12, 13, 15, (17-7), 19, 20, (22-7)</td>
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