SYMBOLIC INTERACTIONISM AND THE CELL INFORMATION BOARD: CHALLENGING THE WISDOM OF SYSTEMS

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Abstract

Claudio Ciborra in "The Labyrinths of Information: Challenging the Wisdom of Systems" argues that the position of information and communications technology (ICT) in organizations requires a shift from the present focus on the "scientific paradigm" to an "alternative centre of gravity: human existence in everyday life". This paper takes up Ciborra's challenge by examining the focal point of social interaction during a longitudinal study of engaged scholarship in an Irish multinational subsidiary. During this study there was a gradual realization that the main locus of interaction was the cell information board. It was here that people gathered to assimilate digital information sources and transform these into "acts" including workpractice improvements. The paper seeks to answer the following question: how does symbolic interactionism enable the conceptualization of an information system as a sign-action system? The work makes a contribution by examining a supply chain information system as a form of symbolic action. The study challenges us to view information systems as not primarily being the IT artifact but pertaining first and foremost to human activity as its very core.

Keywords: symbolic interactionism, signs, symbols, semiotics, dialogical action research.

1. Introduction

Claudio Ciborra in *"The Labyrinths of Information: Challenging the Wisdom of Systems"* argues that the position of information and communications technology (ICT) in organizations requires a shift from the present focus on the "scientific paradigm" to an "alternative centre of gravity: human existence in everyday life". Furthermore he described this re-alignment in terms of a Copernican revolution in the way organizations introduce and use ICT (Ciborra 2002). This paper takes up Ciborra's challenge by examining the focal point of social interaction during a longitudinal study of innovation management in an Irish subsidiary of APC by Schneider Electric. The Corporation had a sophisticated portfolio of information systems (IS) that included: a collaborative client-server software platform; an enterprise resource planning (ERP) system and a customer relationship management (CRM) suite. During the study there was a gradual realization that the main locus of interaction was the cell[1] information board (CIB) shown in figure 1.

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[1] The term "cell" here refers to a manufacturing cell (aka work centre) consisting of a group of workers and machines. Work is normally organized so that each cell produces a certain family of parts either sub-assembles or finished products (ref Groover, M.P. 2001. Automation, Production Systems, and Computer-Integrated Manufacturing. London: Prentice-Hall International. P. 421).
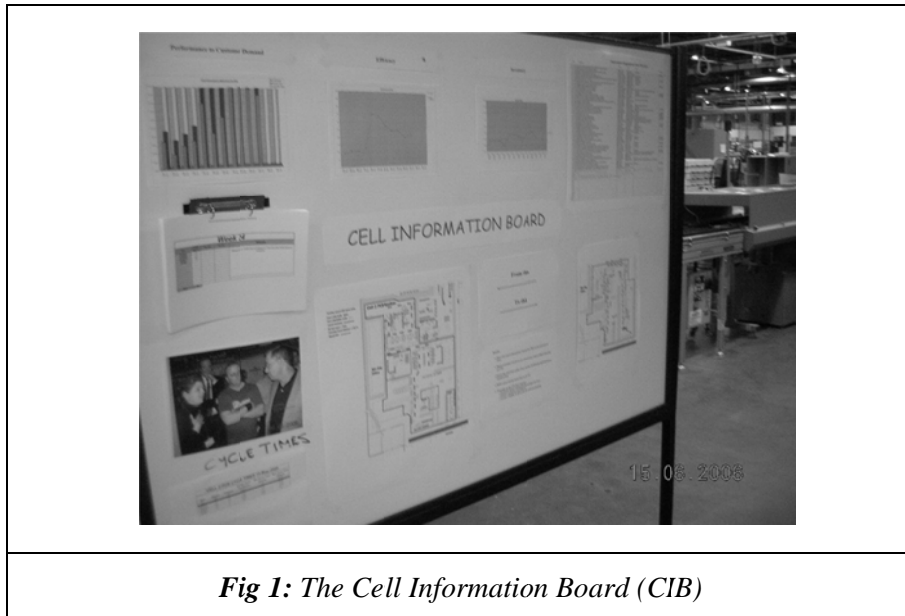
Fig 1: *The Cell Information Board (CIB)*

It was here that people gathered, formally at the daily scheduled meetings and informally at other times, to assimilate the digital information sources and transform these into "acts". Here the signs and symbols of the value chain were presented, told their stories and solicited action. The CIB became the main position of workplace improvement, being an artifact that was regularly refreshed during the day as updated information became available. In this study we argue that the IS discipline must rethink its conceptualization of an information system from being a digital artifact to being an analogue symbolic representation that facilitates human interaction. In doing so, IS will need to go back to its "roots" as encapsulated in the earlier definitions of an information system. The approach employed in the study is dialogical action research (AR) (Mårtensson and Lee 2004) which provides a novel methodology to address the perennial call for more relevant and rigorous collaboration between academics and practitioners (Avison et al. 2004; Benbasat and Zmud 1999; Cranefield and Yoong 2007; Davison et al. 2004; Dubé and Paré 2003; Lee 1989; Zmud 1996) . Herbert Blumer (1954) wrote that "social theory in general shows grave shortcomings. Its divorcement from the empirical world is glaring"(p. 3). This study seeks to address Blumer's concerns as it applies to the socio-material world of information systems research.

The main intent of the paper is to develop a new perspective to understand information systems as an integrated sign-action system based on the qualitative analysis of a case study.The paper seeks to answer the following research question: how does symbolic interactionism enable the conceptualization of IS as a sign-action system?

The layout of the paper is as follows. Firstly there is a review of the literature on signs, symbols and semiotics together with the symbolic interactionism of Herbert Blumer (1969). Then there is an overview of the philosophical questions arising from the call for more pragmatic research engagement (Ågerfalk 2010; Goldkuhl 2012). After this the research approach is outlined followed by the presentation of the case study. Finally the key findings are presented together with a conceptual model of symbolic interactionism in light of the case study and the call for the utilization of diverse theories by Orlikowski and Iacono.

2. Sign, Symbols and Semiotics

Throughout civilization people have utilized signs and symbols to convey their thoughts where language alone does not suffice. Symbols and images are used as a shorthand for ideas and concepts (Wilkins 2003). Let us begin with two important definitions (ODE 2006)

> A sign is an object, quality or event whose presence or occurrence indicates the probable presence or occurrence of something else
>
> A symbol is a mark or character used as a conventional representation of an object, function, or process

Importantly for IS, the theory of signs is the "philosophical and scientific theory of information-carrying entities, communication, and information transmission" (Wilson 1999).

A comprehensive theory of signs can be traced back to the medieval scholastic philosopher John of Saint Thomas (Gracia 1999) which attracted significant attention in the 20th century from philosophers such as Maritain (1999).

He developed taxonomy of signs (Murphy 1999) firstly according to their relationship with their objects:

- Natural signs (dark clouds as a sign of rain)

- Customary Signs (decorations as a sign of a celebration)

- Stipulated signs (when an acronym is coined)

Secondly according to their relationship to the mind:

- An instrumental sign which in the first instance must be cognized as an object before it can signify (e.g. a written word)

- A formal sign in contrast directs the mind to its object without having first been cognized (e.g. percepts and concepts)

John Locke, the eminent English philosopher of the 17th century, introduced the term *semiotic* as the science of signs and signification. Later Edmund Husserl proposed a twofold sense to the word sign – it may signify expression or indication (Derrida 1973). Furthermore he insisted that "there can be no sign without signification, no signifying without the signified" (p. 17). Interestingly Ricour called the early work of Husserl, his *Logical Investigations*, as "the phenomenology of signification" (Moran 2000).

A near equivalent term to semiotic is *semiology* which was proposed by the Swiss linguist and founder of the school of structural linguistics Ferdinand de Saussure (Wilson 1999). The distinction between sign and symbol was first explored in the work of C.S. Peirce an American philosopher of the late 19th and early 20th century who is best known as the originator of pragmatism (Blackburn 2005) .

Symbols are used in place of something to bring it to mind or to elicit appropriate reactions or emotions. Semiotics according to Peirce is primarily a theory of understanding the interpretation of signs which involves developing our knowledge of the object in question (Hookway 2005). Importantly Peirce proposes that we think only in signs for we are, in the words of Chandler (2007), *homo significans* "meaning makers". In addition Chandler counsels that as we are surrounded by signs then those who do not understand them and their associated systems are in greatest danger of "being manipulated by those who can". Semiotics is too important to be left to semioticians (p. 225) and it draws heavily on the concepts and ideas from linguistics which is a more established discipline. Sassoon and Gaur (1997) argue that in this computer age young designers must learn the accumulated wisdom of over five hundred years of printing signs and symbols. Furthermore software architects must be cognizant of all the elements of design; such as letters, signs, symbols and icons; knowledge that cannot be substituted wholly by technical ingenuity. For information is carried by signals and

flows through signaling networks which not alone transmits the signal but "filters, combine and processes it in various ways" (Skyrms 2010).

Let us now take a closer look at the two schools of semiotics, the European school associated with Saussure and the American school associated with Peirce and the pragmatists (Wiley 1994). Saussure's model of the sign is in the dyadic tradition of Augustine, Albert Magnus, Hobbes and Locke. As shown in the figure, the dyad consists of a signifier (form which the sign takes) and the signified (concept to which it refers).

***Fig. 3****. Semiotics after de Saussure (Chandler p. 14)*
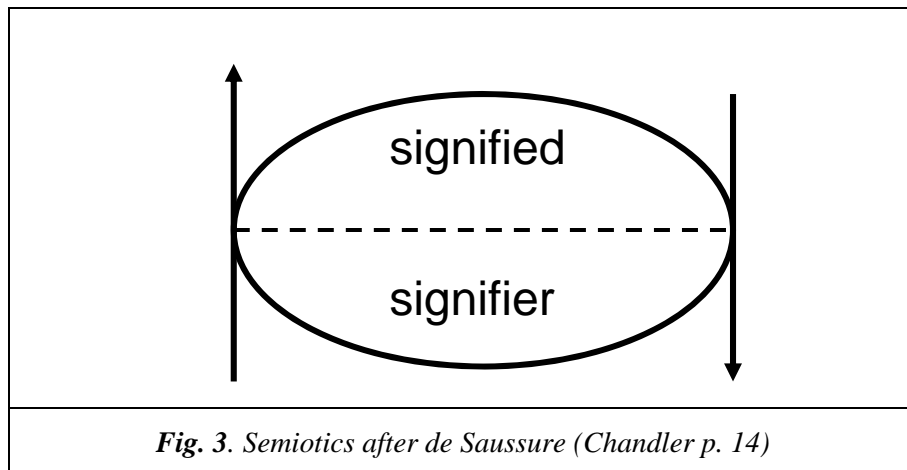
The relationship between the signifier and the signified is known as signification and is shown in the diagram as being a full duplex arrangement by means of arrows. Saussure taught that the signifier and the signified are two sides of the same coin.

Derrida was an admirer of the way in which Saussure "absorbed linguistics into seminology …thereby paving the way for grammatology" (Moran 2000) (p. 450). Saussure considered the spoken sign to be more important than the written sign as language and writing are different systems of signs (p 462).

Peirce offered a triadic theory of signs and this formulation can be traced back to Plato, Aristotle, Husserl and Morris. He classified signs as natural (e.g. clouds sign of rain) or invented (e.g. a picture of a man with a shovel indicates road-works). The latter he termed *icons* as they bear a natural resemblance to that which is signified. Furthermore sign relations encompass the following triad (Hilpinen 1999):

- Involving the sign itself (representantum)
- Its object (or what the sign stands for)
- An interpretant (how the sign represents the object –the meaning of the sign)

This formulation is shown in figure 4 below.

Fig 4. *Semiotics after Peirce (Chandler p. 29)*
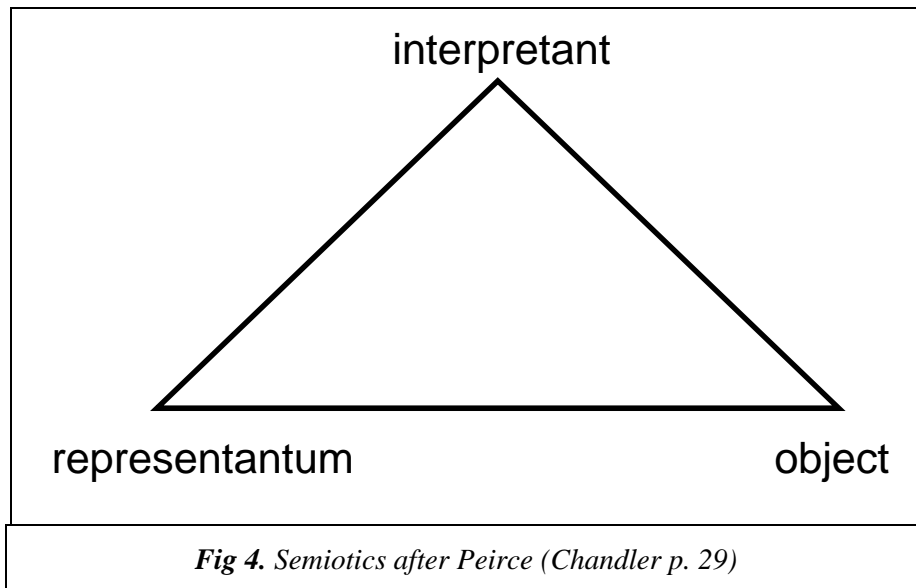
Habermas (2001) asserts that "mind only makes contact with its environment in a mediated way" and offered the following thought-provoking meditation on symbols by Ernst Cassirer (p. 7).

> The fact that sensory contact with the world is reworked into something meaningful through the use of symbols is the defining feature of human existence, and also constitutes from a normative standpoint, the basic trait of a proper human mode of being.

Now we will proceed to investigate symbolic interactionism as developed by Herbert Blumer.

The Symbolic Interactionism of Herbert Blumer

Symbolic interactionism is a neologism coined by Herbert Blumer in the 1930s and is primarily associated with the field of sociology where it provided a distinctive approach "to the study of human group life and human conduct" (Blumer 1969). The methodology rests on three premises (p.2):

1. Human beings act toward things on the basis of the meanings that the things have for them.

2. The meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows.

3. These meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters.

These *things* consist of everything a person may encounter in his world including physical objects, other human beings and categories of human beings, institutions, guiding ideals, activities of others and situations that the person encounters. Furthermore social interactionism is based on a number of fundamental ideas or "root images" as Blumer calls them.

- Human groups (society) consist of human beings who are engaging in action.

- A society consists of individuals interacting with one another.

- The *worlds* that exist for human beings and their groups are composed of *objects* which themselves are the product of symbolic interaction. The meaning of objects arise out of the way they are defined by others with whom he interacts (p. 11).

- The human being is an acting organism and the human being can be an object of his own action (p. 12). Thus Blumer differs from the prevailing schools of thought that see human behavior as being a product of the factors playing on its organization or an expression of the interplay of parts of its organization (p. 14).

- The human has to construct and guide his action instead of merely releasing it in response to factors playing on him or operating through him (p 15).

- The joint action of a group or collectivity is an inter-linkage of the separate acts of the participants and must undergo a process of formation even in well-established forms of social convention (p. 17). In a comment that that is surely relevant for our interconnected world, Blumer sates that a network or an institution does not function automatically because of some inner dynamics or system requirements. It functions because people at different points do something and what they do is a result of how they define the situation in which they are called to act (p. 19).

In terms of methodology Blumer emphasizes that the empirical world must always be the central point of concern for research –the point of departure and point of return. The proper picture of empirical science according to Blumer is that of a collective quest for answers to questions directed to the resistant character of the given empirical world under study (p. 23). In a hard-hitting summary of the four customary means of social science research namely: adhering to scientific protocol, engaging in replication, testing hypotheses, and using operational procedure, he states that these do not provide the empirical validation that genuine empirical science requires (p. 32). He highlights the importance of get to know the empirical worlds that human beings operate in and to examine them closely. The metaphor he uses for social science research is that of lifting a veil that obscures or hides what is going on. These veils are only lifted by getting close to the area and by digging deep into it through careful study (p. 39). This however is not a simple matter and it is demanding in a genuinely rigorous sense when viewed in its two constituent parts: exploration and inspection. Procedure such as direct observation, interviewing, listening to conversations, letters, diaries, and group discussions should be adapted to circumstances and guided by judgment of its propriety and fruitfulness. Bulmer proposes that the researcher seeks out participants in the sphere of life being examined who are acute observers and who are well informed. One such person, he observes, is worth a hundred more unobservant participants. He particularly advocates that discussion and resource group of these "elite" participants are many times more valuable than any representative sample (p. 41). Symbolic interactionism is a down-to-earth approach to the scientific study of human group life and human conduct conscious of the mission of empirical sciences to come to grips with the empirical world (p. 47).

> For symbolic interactionism the nature of the empirical social world is to be discovered, to be dug out by a direct, careful, and probing examination of that world (p. 48).

Furthermore the human being is not a mere responding organism… he is an acting organism (p. 55).

Now we will provide some detail on the methodology employed in this research as it is an essential component of the argument of the paper.

3. A Philosophical Underpinning of "Action"

> *What we have to learn to do we learn by doing –Aristotle*

This section will explore the meaning of the terms pragmatic and praxis and argue that they have a long and controversial (in the best sense of the word) influence on the world of philosophy.

The Oxford Dictionary of English(ODE 2006) defines pragmatism as follows:

> Dealing with things sensibly and realistically in a way that is based on practical rather than theoretical considerations.

Praxis (from the Greek *prasso* –doing or acting) concerns the theory of human activity and shares an etymology with pragmatism in the root meaning of *pragma* (deed, affair). According to Schrag (1999) the concept of praxis can be traced back to Aristotle to denote the "sphere of thought and action that comprises the ethical and political life of man, contrasted with the theoretical designs of logic and epistemology (*theoria*)". While praxis is now almost completely identified with Marxism, Heidegger in *Being and Time* sought to recover the real meaning of the term in Aristotle's conception of human praxis (Moran 2000). Hannah Arendt was deeply influenced by Heidegger's lectures on Aristotle and

is considered as rehabilitating the notion of praxis in her account of "action" (Moran 2000). The concept of praxis is also considered to be very influential on the development of critical theory which links the term to the "phenomena of discourse, communication, and social practices" (Schrag 1999). In Eastern Europe the Praxis school published the Marxist journal *Praxis* during the 1960s and 1970s and ran a summer school that attracted Western scholars. The central concern of this group was to "study and influence the role of free creative activity in changing and shaping ethical, social, political, and economic life along humanistic socialist lines" (DeGeorge 2005). Karol Wojtyla was another influential phenomenologist who sought to reclaim praxis from Marxism by proposing his own theory of human action. McNerney (2001) contends that Wojtyla's magnum opus *The Acting Person* "can be understood in itself as a restatement of a philosophy of praxis" (p 126). The question of how to define human praxis is fundamentally based on how you define the human person and Wojtyla argued that the human person must be regarded as a self-determining subject who is the "efficient cause of his/her own actions" (p 126). This is in contrast to what he regarded as the de-humanising dogma of Marxism. Furthermore human activity operates inter-subjectively –within a community of persons (p 129). Work according to Wojtyla has not just an objective sense such as the transformation of nature into products but has the subjective sense of contributing to self-fulfilment (p 159). In Wojtyla's schema a person revels himself in action (p 2).

> [Action] reveals the person and we look at the person through his action…Action gives us the best insight into the inherent essence of the person and allows us to understand the person most fully. We experience man as a person, and we are convinced of it because he performs actions.
>
> *(Wojtyla 1979)*

Similarly Goldkul (2004) emphasises the importance of actions in the Pragmatist tradition.

> The primary concern, following a pragmatist position, in the empirical world is actions. This does not mean that a pragmatist is only concerned with actions and disregards other issues. A pragmatist researcher lets actions appear as something significant and fundamental to study.

The purpose of this section was to demonstrate that the quest to be practical has a long history within and without of the information systems world. Now the paper will provide an overview of how engaged scholarship through action put into practice the theoretical considerations of the opening section of the paper.

4. Study Overview

Lewin is famous for his assertion that "there is nothing as practical as a good theory". However we will take the aphorism of his student Bronfenbrenner (2005) who reversed the classical Lewinian maxim to read: "There is nothing like the practical to build a good theory" (p 48). This is part of a tradition that goes back to Aristotle "who made frequent reference to concrete example to illustrate his theoretical points" (Kenny 2010). Consequently we will outline the empirical study as we grappled with the topic of innovation in a multinational company and reflected on the role of the practitioner and researcher in the process. This study is based in APC Ireland, formerly a subsidiary of the American Power Conversion (APC) Corporation. APC entered a major period of transition in the first quarter of 2007 with completion of its acquisition by Schneider Electric and the formation of a new subsidiary called APC (by Schneider Electric). The strength of the MIS function in APC was viewed as an important advantage by Schneider in their acquisition analysis and APC's "intimacy with information technology" was identified as central to the creation of synergies with Schneider's power solutions subsidiary MGE. As the main part of this study was developed before the acquisition, this section will focus on providing a background to the APC context in which the work was carried out (APC 2011). APC designs, manufactures and markets back-up products and services that protect hardware and data from power disturbances. The explosive growth of the Internet has resulted in the company broadening its product offerings from uninterruptible power supplies (UPS) to the high-end InfraStruXure[TM] architecture in order to meet the critical availability requirements of internet service providers (ISP) and data-centers. This modular design integrates power, cooling, rack, management and services, which allows customers to select standardized modular components using a web-based configuration tool. The Corporation reported sales of $2 billion in 2005, globally employs

approximately seven thousand people and is a Fortune 1000 company. APC aims to set itself apart from the competition in three areas: financial strength, innovative product offerings and efficient manufacturing. However, financial reports had stressed that the company needs to implement significant improvements in manufacturing and the supply chain (Results APCC 2005; Results APCC 2006). According to these published reports, the company needed to work to develop a "lean, customer-centric, ambidextrous organization" in order to reach "optimal efficiencies in our processes". APC had two locations in the West of Ireland that serve EMEA region. The Manufacturing Operations site, based in Castlebar, employed approximately 100 people; and a number of functions including sales, information technology, business support and R&D are situated in Galway with workforce of approximately 300. The widening of a focus from the manufacturing of discrete products, such as UPS, to the delivery of customized InfraStruXure^{TM} solutions provides both challenges and opportunities for the Operations function. Responding to the supply chain challenge, a Lean Transformation Project was set up in the Castlebar campus in February 2006 with a cross-functional team of twelve members drawn from Management, Engineering, Manufacturing, Materials Planning, Quality and Logistics functions. The Lean Project team set an objective to quickly deliver the message that Ireland is responding to, and leading, the corporate initiative and to provide a platform for the Irish subsidiary to obtain a reputation as an innovative location. An initial corporate feedback is that this project is "ahead of the curve" in terms of the other regions. A major requirement from corporate executives was that any innovations resulting from the initiative could be replicated in other regions.

APC Ireland is keen to take the leadership role in enhancing its global competitiveness by becoming a knowledge leader in the area of supply chain expertise. The manufacturing practices and processes used within the corporation have come under increased pressure from global competition. In addition, building up a lean enterprise is treated as a corporate-wide task. Now we will outline the research approach undertaken in the study.

5. Research Approach

The research approach utilized in the longitudinal study of innovation management in the Irish subsidiary is now presented.

The conclusions by Benbasat & Zmud (1999) concerning the lack of relevance in MIS research were, to put it mildly, a criticism of the discipline. Consequently the initial approach to the case study was closely related to the following recommendation in their paper:

> Researchers should look to practice to identify research topics and look to the literature
> only after a commitment has been made to a specific topic.

However, the linear nature of their recommendation does not sufficiently accommodate the dynamics of a real-world corporate environment so this study adopted a more iterative approach, going from practice to literature in a continuous cycle. The study is presented from the perspectives of a researcher undertaking a longitudinal study of innovation management in the Irish subsidiary with the back-up of colleagues in the research area. Slappendel (1996) recommends using a research team approach to overcome limitations when examining innovation in organizations from the interactive process perspective.

The innovation project consisted of two main phases outlined below: an interpretive study during 2006 followed by dialogical Action Research in 2007. It is notable that Mårtensson and Lee (p 515) advocate that the researcher, akin to an anthropologist, spends a year-long ethnography to understand the world of the practitioner.

Data collection methods during the initial phase involved: maintaining a log book, reviewing documents and information systems, records, interviews, observations (direct and participant), artifacts and surveys in order to develop a database and body of evidence (Gillham 2000; Yin 1994). A total of 29 unstructured or open interviews were undertaken that involved approximately 60 hours of interview time and 24 days spent in the company sites. The interviews were conducted across a wide area of the organization that included: Senior Managers with global, EMEA (Europe, Middle

East and Africa) and site responsibilities, Middle-Managers, Team Leaders, Engineers and a number of people in general planning roles. Furthermore the researcher had the status of a temporary employee with his own email address and intranet access.

There was an agreement in January 2007 to move forward using dialogical Action Research with meetings every two weeks. In their paper Mårtensson & Lee propose that "reflective dialogues outside the organization can help the manager to reflect on, learn from, and remedy managerial problems in the organization". In particular, the discipline of having to take regular timeout in a time-pressured manufacturing environment was a major incentive for the Plant Manager to agree to this approach. The Plant Manager also considered the framework advantageous since it allowed him to retain control and responsibility for all decisions, implementations and communications. However there are a number of practical risks with this type of longitudinal research in a dynamically changing corporate environment, such as the realities of reorganizations and relocations that are not pointed out by Mårtensson & Lee.

In addition to the above there were 11 meetings with the main point of contact for the project which totalled seventeen hours in duration. These meetings became the basis for the dialogical AR approach during the second phase of the project. Data collection during the dialogical AR period involved recording of the meetings which were subsequently transcribed verbatim by the researcher. Given the rich nature of the data, this was considered the optimum way of capturing the reflective meaning and ensuring consistent interpretation. Analysis was done manually through the examination of each meeting transcript and providing a summary of the topics discussed in the transcripts. This then was sent to the plant manager for evaluation and agreement that it was an accurate portrayal of the meeting. In total these transcripts ran to over 60,000 words. A profile of the interviews is set out in the table below.

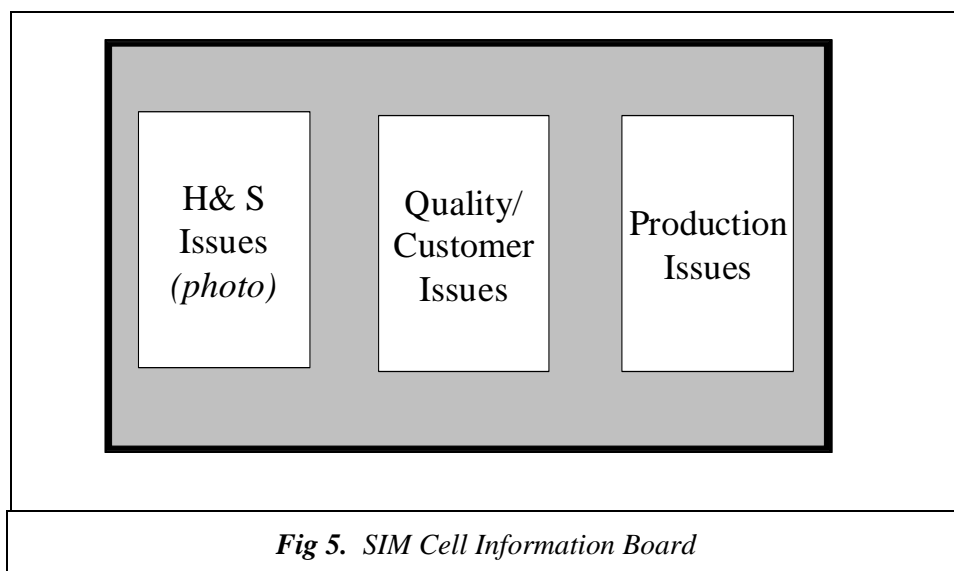| *Table 1.* Data Collection Summary		
Number of Formal Interviews Estimated hours	22 34.5	Senior Managers Middle-Managers, Team Leaders, Engineers
Meetings with main point of contact (additional to above) Estimated Hours	11 17	Senior Engineering Manager
Dialogical Action Research Meetings Estimated Hours	16 22.5	Plant Manager
TOTAL INTERVIEW HOURS	74	
TOTAL DAYS ON SITE	42	
Additional detailed discussions Estimated Hours	8 18.5	VP for Software Development, Customer Engineers, Customer Service Manager.

The interviews were conducted in a responsive (Rubin and Rubin 2005) or reflexive (Trauth 2001) manner, allowing the researcher to follow up on insights uncovered mid-interview, and adjust the content and schedule of the interview accordingly. In order to aid analysis of the data after the interviews, all were recorded with each interviewee's consent, and were subsequently transcribed, proof-read and annotated by the researcher. In any cases of ambiguity, clarification was sought from the corresponding interviewee, either via telephone or e-mail. Supplementary documentation such as minutes of meetings, company records, quarterly published reports, quality statistics and customer feedback was analysed.

6. Findings and Analysis

Now the main findings of the study will presented together with an analysis using the theoretical framework of symbolic interactionism. The transcripts of the dialogical action research indicated one major process innovation which had a significant impact on the operations function. This was the short interval management system (SIM). This section will provide an overview of SIM derived from a procedure issued by the Castlebar plant manager. SIM has a dual purpose to effect communication and support running of the production line. Its function is to communicate any issues upwards through the organisation and to feed information to the production line. It is designed to enable the speedy communication to all concerned of potential health and safety issues, feedback from customers and quality issues; as well as to track production build versus the production plan. By definition the system is short interval with the approach of breaking large tasks into manageable sizes and then reporting progress on a daily basis. Production teams meet twice every day for a maximum of ten minutes and the meeting is chaired by the cell supervisor or delegate. The chief communication vehicle of the process is the SIM "cell information board" where the health and safety, quality and production issues are captured and dealt with in that priority. To enforce the priority given to health and safety, the supervisor is responsible for posting a photograph on the problem on the board. The board information has a standard format with the health and safety issues on the extreme left, followed by quality issues and production issues with the priority from left to right. Any potential barriers to meeting the build plan are identified and if necessary escalated to the support staff.

The cell support team hold a mandatory daily meeting which should be a maximum of thirty minutes which is run by the production manager. Membership of this team includes the manufacturing and quality engineers, the material specialist and the cell supervisor. These meetings are also open to any of the management team to attend. The agenda follows the set priority referred to earlier where the following issues are reviewed: Health and Safety; Customer feedback; Quality issues; Issues escalated from the production SIM meeting; Agreed action items from the last meeting; Feedback from operations personnel on active issues and finally agree the issues for action prior to the next meeting.

The last item requires actions to be both specific and deliverable with the focus on meeting the short interval rather than any long term requirements. The layout of the SIM CIB, shown in figure 5, reinforces the priorities outlined above.

| H& S Issues *(photo)* | Quality/ Customer Issues | Production Issues |

Fig 5. *SIM Cell Information Board*

The following extracts from the transcripts illustrate the impact of the SIM process on the operations of the manufacturing facility and we will reflect on these data from the perspective of symbolic interactionism (SI) outlined in pages 5 and 6 of this paper. We will refer to the SI construct by placing

the reference in italics as we examine relevant abstracts from the dialogue. As a general point, the use of dialogical AR and the in-depth analysis of a dialogue with one key actor are in keeping with Blumer's assertion *that one "acute observer" is worth a hundred "unobservant participants".*

Firstly SIM was instrumental in the plant receiving a National Award for Health and Safety.

> The National Standards Authority of Ireland (NSAI) is responsible for checking health and safety (H & S) procedures. There was a Health & Safety conference recently where they announced the winners of different categories. We won the regional ward for the West. What's more we won the new Gold Standard in Occupational Health & Safety award which is actually the SIM processes [in operation]. The judge thought it was the bees-knees and it was really groundbreaking.

SI perspective: The joint action of a group (i.e. the APC Health and Safety team) undergoes a process of formation and is a result of the interlinking of separate acts of the participants.

The next extract refers to the operation of the SIM process

> The SIM process gives visibility to everyone on the floor; it drives closing things off; it encourages people to come forward with their suggestions. Those are things that make the difference.

SI perspective: The people do not just respond blindly to external factors but take responsibility for constructing and guiding such actions.

In this extract SIM drove an organization change from the bottom-up.

> So in terms of organisational change; something like the SIM process puts a mechanism in place that allows people to get their ideas implemented. So while the majority might be incremental – bigger ones can come out as well. It is definitely relevant because … for example something which came out of the SIM process ironically was a big defect in our health and safety ownership because X was out sick for a month and we had no back-up. So the sign-off sheet was blank. What was great is that it was picked up on while we were preparing for these visits [from company executives]. People starting saying that the H&S area was blank for weeks and would look terrible to anyone visiting. The message went up on the SIM board that we had no cover when the health and safety person was out. To me that is and organization change because we now have to put an organisation in place so that when Joe Bloggs is out sick –we have a cover.

SI perspective: the people reacted towards the blank sign-off sheet based on the collective meaning it had for them.

This extract suggests that SIM is based on standard Lean processes but has been adapted for the Schneider production system.

> Really the Toyota Way or any other of these books on Lean –they talk about a fast- food chain and having a 5 minute meeting in the morning to start to plan for the day. That is very much the same thing but we call it SIM. In terms of here there is nothing proprietary about it. It's having regular meetings one to one and giving people opportunities to come forward with their ideas. Something else came up today-and I need to push this again- everything comes up from the SIM meeting …we had some major part issues that is going to hurt us on the bill plan this week. When we started digging into it -it bubbles up through the SIM process – and when we looked at that again it highlighted that our structure is all wrong.

SI perspective: empirical world is the central point of concern

Here again we see that the SIM process is providing a mechanism to harness process innovation.

> I will give you a more basic insight into what SIM is about. People are inherently intelligent ….and once you put a mechanism in place to use that [intelligence] they will use it. That's where you will get your organisational change from. In the absence of our SIM process we didn't have the mechanisms to either get the suggestions from people or to get people to act on it. So by putting

that mechanism in place you are allowing that natural ….instinct to want to create. People want to create everyday but if they don't have the mechanism to allow them to do that it just won't happen. The SIM process allows the natural creativity go forth and suggests the changes. The SIM process provides the structures to get them implemented.   These are just some example of how this is coming about.

SI perspective: A network does not function automatically but from acts of people.

The amount of suggestions being captured by the SIM process was significant.

Oh yes ….even if you look at our SIM process there we said that the operators handwrite it on the board –I will explain that to you - then we get Y to type it up ….she typed it up last Friday and it is nearly full again now. That is significant. I don't have a number but just at a simple level passing by the sheet and noticing that it is full again.

SI perspective: the operators reacted to the symbolic nature of the SIM process sheet

The motivational aspect of SIM is highlighted in the following extract.

That means people are using it. Again it is a motivating thing. If I come up with suggestions every day and don't know if they are being implemented – there is no motivation. Whereas, if you come up with suggestions and see them being closed off, then you are more likely to come back with another one and another one. There is also visibility that they are being closed off – if you see the green mark on the board –there is my name ….and they are being closed off –then I am more likely to comeback with more suggestions.

SI perspective: humans react on the bases meanings things have for them

The advantage of SIM replacing multiple and often invisible processes is now highlighted. Also this extract highlights that the SIM process acts as an information system *per se* if you consider the definitions that do not emphasise a computer system.

We had too many other things before. We had process audits that went out to check our processes, we had a health & safety [process] but it was not as structured; we had our test process where we looked at failures; we had me walking around complaining that the place is looking disorderly and to get it to look more organised. The point I am getting to here is that there were multiple ways for things to get suggested. There are a couple of problems with that, because there were not structured methods around it …all the things I told you about. If Joe Bloggs on the floor sees an opportunity for improvement, none of those methods that I just described lend themselves to that person making a suggestion. Secondly if someone was really proactive and identified a trip hazard it goes up into a database which is invisible because the operators don't use the computer system so they don't know if it is being actioned or closed off or not. Whereas now this is visible and instantly actionable – they can see day to day what is being done about it.

SI perspective: things consist of everything a person encounters in his world

The advantage of quick feedback is highlighted here.

Maybe that is the difference when you are comparing the before and after. The "before" has multiple different [processes] with no feedback mechanisms. There was also a gap where if someone wanted to make a suggestion that was not health and safety related they could not. The big difference in the "after" is that people can see their suggestions being acted on and have to sign off that they are happy with it.

SI perspective: meanings are derived using an interpretive process

The need for an automated information system to be built around SIM is discussed in the next extract

> The reason I put IS up here is that we want our IS system to measure the SIM activity in some way. …. if you look at it from the point of view of the execs ..when they come in and we tell the guy we are being innovative ..he will ask us to justify why we are saying that.

> ……the point of the SIM activity is that small incremental changes are 100% of what it is about. So I would not like them to see that other guys are getting more recognition for coming up with the big idea – it is the 100 incremental ones that add up.

SI perspective: the human being is not just reactive but an acting organism

However, a second survey of the staff using the Tidd *et al* (2005) questionnaire uncovered that not everyone was "embracing the SIM process".

> Ah –no- it is interesting to read the comments. Not everybody is embracing the SIM process but some people do see it as being a help.

SI perspective: meanings are derived from social interaction

Finally while being a vehicle for process innovations SIM was regarded a being a radical innovation in itself.

> I like how this has evolved actually, how innovativeness can be viewed as having two aspects..…. the incremental and the radical. The SIM process is a radical new process [innovation] itself.

SI perspective: what people do is a result of how they define a situation

The purpose of this section was to present the findings from the researcher's interaction with the plant manager in terms of the theory of social interactionism outlined earlier in the paper. This was done in a novel way by examining extract from the dialogues in relation to the SI perspective. It sought to "dig out" and "probe" the empirical "world" encountered during the interactions. We will now go on to discuss implications from our review of SI and our findings from the empirical domain.

7. Discussion

In a commentary on their seminal 2001 paper, Orlikowski and Iacono (2006) contend that "a diversity of perspectives, methods and theories will help us make adequate sense of the development, use and implications of information technology in society" (p. 290). In the previous paper they had proposed that further research on the circumstances that "enable people to make dynamically complex systems work in practice may be critical "(p. 132) (Orlikowski and Iacono 2001). In our paper we argue that symbolic interactionism is an established theory which can enlighten the conceptualization and sense-making of IS as a sign-action system. Furthermore the situatedness of the cell information board enabled the actors in the case study to make the complex array of information systems "work-in-practice". Now we will further develop this argument by returning to some early definitions of IS.

In terms of information systems this study fits into the broader category of the definition of an information system as taken from Buckingham *et al.* (1987) cited also by Fitzgerald *et al.* (2002) .

> **An information system** is a system which assembles, stores, processes and delivers information relevant to an organisation (or to society), in such a way that the information is accessible and useful to those who wish to use it, including managers, staff, clients and citizens. An information system is a ***human activity (social) system*** which may or may not involve the use of computer systems (*emphasis ours*).

The following definition of information is given in the early work of Whitten, Bentley and Ho (1986) also fits into the broader category.

> **An information system** is an arrangement of components that interact to support the operations, management, and decision -making information needs of an organisation

The study has challenged us to view information systems as not primarily being the IT artifact but pertaining first and foremost to human activity as its very core. This is what Ciborra termed as an "alternative centre of gravity: human existence in everyday life" and is particularly relevant to the theme of innovation which was the initial motivation for undertaking this research. As a result it is argued that a return to the early and broad definitions of IS (e.g. Buckingham *et al.* adopted for this study) can help us grapple with the difficult conceptualization of innovation and its relationship to information systems. Furthermore in the area of information systems development there is recently an increasing interest and study of Agile development and its link to innovation (Conboy et al. 2011; O'hEocha and Conboy 2010; Wang et al. 2012). Perhaps we need to look to the "storyboard" as the place where innovation is facilitated rather than in processes or systems. Our study demonstrated that the analogue and visible milieu where innovation takes place is through the human social information system rather than through the mediation of the IT artifact. A suggestion would be to further investigate how ISD storyboards could be designed to accommodate the capturing and diffusion of innovations.

Towards a conceptualization of an information system as a sign-action system

The concepts introduced in the literature review: Saussure's theory of signs and Blumer's presentation of symbolic interactionism are now combined in light of the empirical case study to form a model. A significant and new process innovation, short interval management (SIM) was introduced during the study and this became the focus of the practitioner and researcher attention during phase 2 of the project. Using the broad definition of an IS presented above it is argued that the SIM is a *de facto* information system which acts as the human interface to the ERP (enterprise resource planning) system and other IS applications. Furthermore this transformation was likened to a digital to analogue conversion process by the plant manager. "Digital" information is extracted from the ERP and other information systems and placed on the SIM CIB, in an "analogue" format by the relevant people in the organization. The human activity of symbolic interaction results in the database information being prioritized and acted on. For example the ERP forecasts were transformed into daily build plans and takt[2] times. After the work is completed, the updated information is then placed back into the relevant systems for further processing. In this conceptualization presented in the figure below, the SIM becomes an interface and a transformation location; between the digital world where the information resides and an analogue world where the information is acted on and implemented. Figure 6 shows the IS raw information in Saussurean terms as the signifier (form which the sign takes e.g. ERP data). By a process of signification, carried out by human actors, this data then becomes signified onto the cell information board i.e. it conceptually shows the sign (data) which it refers.

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[2] The maximum time allowed in order to make the product meet the demand.

Fig 6. *Symbolic representation of IS as a sign-action system*
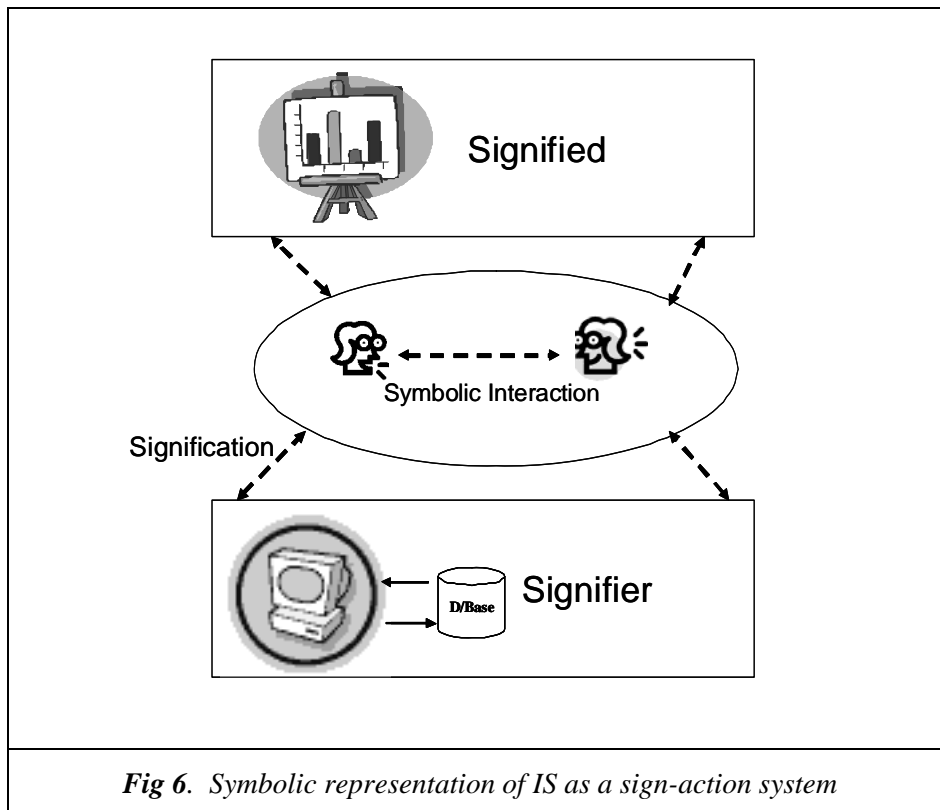
Thus through a process of symbolic interactionism, the humans act toward the signified data on the basis of the meanings that they have for them. The meaning of the signified information is derived from, or arises out of, the social interaction between people engaging with the SIM storyboard. These meanings of the information are then developed through an interpretive process which results in actions by the human protagonists. Finally this symbolic representations are decoded and then transferred back to the IS signifier in the form of processed information that can be transmitted to another place in the value chain where it undergoes a similar signification.

Limitations of the research study include that it was confined to one site. However as Mårtensson and Lee (2004 p. 533) point out there is a growing acceptance of "intensive research methods" and that a single-site case study can be deemed scientific. Lee's (1989) seminal paper also lays the foundation for single case studies. The problem of bias is fundamental to dialogical AR which is based on reflective on-to-one dialogues with a single individual. This makes triangulation more difficult but it is possible to search for supporting external evidence. For example the enthusiasm for the SIM process by the practitioner was backed up by the plant winning an external national health and safety award that resulted from the implementation of the process.

8. Conclusion

This paper builds on the argument of Claudio Ciborra for a re-discovery of the human aspect of information systems. It did this by providing a review of signs and symbols in the literature; specifically from the work of Ferdinand de Saussure and Charles Sanders Peirce. Then it presented the concept of symbolic interactionism through the scholarship of Herbert Blumer. The setting was an empirical study of innovation management in an Irish subsidiary of APC by Schneider Electric. The approach taken was dialogical action research as it provided a mechanism to implement change while keeping the operational details under the control of the practitioner. In particular the paper examined the focal point of social interaction that emerged during the research, namely the cell information board used by practitioners as an interface between the information system and praxis. There are a number of key implications from the work. *The Sciences of the Artificial* (Simon 1996) is having a renewed influence on information systems scholarship, particularly in the area of design science

(Hevner et al. 2004). Simon's thesis proposes that human behavior is *simple* and its complexity is derived from the environment. We would disagree and argue that the human communication of signs, symbols and language and the subsequent actions derived from these are the most *complex* aspects of the information sense-making process. Furthermore, we propose that *homo connectus* can only be understood in term of action and inter-subjectivity (*homo inter-connectus*). This extends Peirce's contention, mentioned previously, that "we think only in signs". Based on our work, we offer a new vision of information systems which combines the school of the "IT artifact" and the "human-centric" school as follows: the primacy of the IT artifact as *service* to the human actor as an acting and interacting agent. Furthermore IS becomes meaningful through the action of signs and symbols. The study presented early non-IT centric definitions of an information system which, it was argued, included the short interval management process observed during the research. A return to these definitions was proposed as a point of renewal of the concept of an information system in the complex world of human meanings and understanding. The contribution of this paper is to propose a novel perspective to understand IS as an integrated sign-action system based on the qualitative analysis of the APC by Schneider Electric case study. Returning to Ciborra (2002 p. 6), we argue that we have provided empirical evidence to support his call that IS involves a human encountering with technology rooted in the world of experience.

> This is the domain of existing in the world. Hence, a different perspective on information systems should be anchored to the unfolding of the human process of encountering the everyday world.

We suggest that the study has implications for other areas of research. This includes agile software development with its emphasis on a storyboard and "scrums", the use of storyboards as instruments of innovation and communication, and the practice of using *living walls* as places of contact and loci of social interaction. Further work is required to provide a firm philosophical underpinning of the model presented in the paper (figure 6) and it is suggested that a phenomenological approach would be profitable in this area using the inter-subjective work of Edmund Husserl, Edith Stein and Hans-Georg Gadamer. In conclusion, perhaps it is time for the information systems discipline to heed the words of T.S. Elliot in *Little Gidding*: "We shall not cease from exploration. And the end of all our exploring will be to arrive where we started and know the place for the first time."

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