

Subjectivity playing leapfrog: keep vs. change: *The cognitive autobiography of an ICT lab during Digital Revolution*

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Abstract

This paper presents a retrospective on the development of a university sociotechnical research group over the past 30+ years, from 1990 to 2024. We reflect on how the group's experience evolved as it pursued innovation in client organizations and enterprises. The group's cognitive and action trajectory has been shaped by subjective factors, affecting intention and interpretation. The group's journey reveals a dynamic interplay between continuity and change, marked by shifts in innovation focus while maintaining a persistent framework of the intervention scheme, and a tension between stability and transformation.

The paper explores the meanings the group attributed to their practice, emphasizing mission-critical theoretical considerations, particularly the concept of autopoiesis. The goal is to offer a fragment of phenomenological understanding of the cognitive dynamics within an STS-aware ICT Laboratory during the digital revolution. Phenomenological understanding involves intuitively grasping the meaning while remaining closely connected to the phenomenon's overall context. This includes deciphering the codes that we observers create to interpret social phenomena, thereby uncovering subconscious, autopoietic, reflexive feedback mechanisms of second-order governance, from the Lab's publications over three decades, as narrating its cognitive autobiography. The paper provides discussion points and insights relevant to the STS community. It aims to enhance understanding of the community's history along the digital revolution and foster discussions on future developments. Additionally, it serves as both an inspiration and a historical record for those new to the field.

Keywords

phenomenology, subjectivity, autopoiesis, interpretation schemes, change for Innovation, socio technical research, social study of information systems

1. Introduction

How does subjectivity manifest and influence the cognitive processes within a university research lab? This paper explores this question by examining how the social group within a research lab subsumes autopoietic psychological mechanisms for survival. These mechanisms arise from the sedimentation and persistence of interpretive schemes, which guide the group's routine actions. When external stimuli conflict with these established schemes, reflexive feedback mechanisms come into play, leading to the selective disregard of these stimuli.

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This study reflects on specific aspects of change, particularly how subjective factors shape these changes, through an examination of the life experience (1990-2024) of an ICT research and development lab, vocated to interventions for digital innovation. While the lab operates within its routine intervention schemes, external pressures sometimes necessitate adaptation. This adaptation is typically achieved by shifting the focus of the pursued innovation rather than altering the underlying interpretive and organizational intervention scheme. The group's trajectory reveals a dynamic interplay between two components of subjectivity: the ability to change focus while maintaining a persistent intervention scheme, and the inherent tension between stability and change of the innovation focus.

We analyse these intertwined autopoietic subjectivities, highlighting:

- a) The *stubborn* continuity of the lab's cognitive and intervention schemes as it engages clients in innovation and change, and
- b) The *aristocratically* selected abrupt shifts in innovation focus that characterise the lab's approach to supporting change.

1.1. Objective and ambition

The objective of the present article is to unveil the character of the tension between these two autopoietic mechanisms – governing stability and change - in the group cognitive trajectory, along the digital revolution undergone by the world that forces innovations into organisations and enterprises. Tending, one, to *repeat*: repeat the specific, successful therapeutic co-constructive approach for instilling and supporting change of specific traits of the client's culture: a socially autopoietic mechanism, internally appropriated by the group. And, the other, to *change*: change by accepting a new specific trait of the modification to be fostered in the client's culture, a type of innovation that then becomes a permanent feature of the Lab cognition and action., whenever the object of this focus – we read - satisfied a specific criterium: a second social autopoietic mechanism. The criterion we read to accept the change of focus – our ambition - shows the character of the tension: only modern machine settings, producing holistic impacts on reality of the connection between people computers and work, are selected and accepted as additional arrows in the Lab's quiver (*faretra*): only those modern machine changes comporting new interpretation schemes, new ways of involving people, new computer technologies, and new organization; changes that are as holistic as the "*Shi*", the oriental, Chinese concept, holistically compounding action, structure, and beauty, mentioned in the quote of Claudio Ciborra that opens the Antecedents Section 2.

1.2. Plan of the paper

We start by framing the article providing some antecedents about the Lab's life. The article is then divided in three Parts. Part I is dedicated to laying down theory considerations that underpin the meanings of human experiences, enabling bits of interpretation of the Lab's parabola. Here, the reflections on subjectivity - the quality of existing in someone's mind rather than in the external world - start with observations on human sense making, by recalling concepts of central relevance in the phenomenological tradition, from life experience of single individuals, to life experience of groups. Ending up with the crucial

concept of autopoiesis [1], the reflexive feedback mechanisms developed and taken in by groups for survival. In Part II, the reflections will reason on the role of subjectivity in science in the making, with focus on time dynamics of socio-technical-research.

Part III contains the main contribution of the article. Here, by using conversational analysis and coding on the text of the articles published by the lab over three decades, the narration of the modification in time of the concepts guiding intervention scheme and innovation focus is exposed to investigation. The reflections will end up with the recognition, in the cognitive biography of LII – our Lab - of two instances of autopoietic mechanism, influencing cognition and behaviour.

The first autopoietic mechanism generates the *continuity* in the stable choice of SPD, the Social Practice Design intervention scheme invented and kept constant by the lab: LII's intervention scheme. The continually crisp grab of SPD onto the significance of meanings in human and social experiences of organizational and enterprise innovation, in front of ever changing digital technologies, is noted. An explanation of the SPD intervention scheme is offered.

The second autopoietic mechanism is related to *change*: the selection, as new kinds of LII interventions, only of those newly proposed focuses embodying “*Shi*”. The principal historical changes of focus will be mentioned.

Conclusions follow.

A watermark of concepts pairs will accompany the entire intellectual journey: science and reflection, subjectivity and intention, autopoiesis and cognition, ethnomethodological accountability and professional attitude, ‘formative context’ and ‘community of practice’.

2. Antecedents

2.1. “*Shi*” and “the web of shared understanding”, stemming out of a workshop

The paper regards in fact the arising of LII's *Social Practice Design (SPD)*: a vital, sociotechnical, organizational intervention approach, for innovation [4, 5, 6]. SPD has been introduced and practiced by a Trento school of the Social Study of Information Systems, i.e., the Laboratory of Information Engineering (LII, in Italian: Laboratorio di Ingegneria Informatica) characterized by the Critical System Thinking (CST) approach. [7, 8]

Founded at the end of the '80s, LII identified since the beginning the relevance in informatics, the art of the artificial, of the concept of *cooperative knowledge processing*, a conceptual focus inherited from involvement in the turbulent conceptual flow of the then developing area of expert systems, part of artificial intelligence. In building expert systems to support the engineering design of residential buildings, for instance, the problem arises of compounding the functions of expert systems on building architecture, with those in potential conflict concerned with specific problem domains, like illumination, or energy savings. So, dealing with artificial intelligence, the concept of *cooperative knowledge processing* was generated, a concept useful to human thinking in addition to “machine thinking” design. Another example that, while striving for building computer automation, human thoughts deepen: as it happened with computational linguistics, for example. Between '91 and '94, LII organized at Pergine in Trentino, in collaboration with Arthur Basking of the University of Illinois, with the participation of

Claudio Ciborra then at Trento, three international workshops on *Cooperative knowledge processing for engineering design*. [9] The workshops identified as useful in cooperative knowledge processing, the social concept of *web of shared understanding* (see B. Baskin in [9], pp. xvii–xx), remnant of that of *community of practice*. Along with the very concept of “*Shi*”, thereafter identified for LII. See Ciborra’s 2002’s list of crucial concepts in the social study of Information Systems [10]¹, that includes “*Shi*”. Details of the surge of “*Shi*” in the story of LII follow.



Fig. 1 : The ideographic symbol for “*Shi*” in Chinese.

“Picture a dragon floating in and out the clouds above a misty mountain landscape. The Chinese would see in this image the idea of “Shi”, that is the idea of force, elegance, movement and irresistible potential for action. Consider, then, any geometric structure, or better pattern, in a landscape, in a poem, in the shape of a building and try to read into it not only symmetry, beauty, but rather movement and action. Establish a link, which in the Western culture may sound problematic, but in the Eastern culture comes as a taken for granted idea, between structure and action, between change as embedded into structure, with no role for an external mover or designer. Modern technical systems embed “Shi”. They are platforms for supporting new organisations, new frames of mind, new implementation strategies, new designs between people. Shared understanding may be a way to elicit and enact the “Shi” embedded in advanced technical systems, in their design, implementation and usage in complex organisations.” By Mitch Tseng, reconstructed by Maria Teresa Cangiani, International Workshops on Cooperative Knowledge Processing for Engineering Design.

“ During the 2nd Workshop, a sudden ‘moment of vision’ (that Kierkegaard and Heidegger would refer to as Augenblick) occurred, when a few participants could share across their respective disciplines , specialisations and cultures the very same image connecting the notions of systems, change, organization and action. The vision occurred when the idea of “shi” was put forward by an Italian participant, immediately recognized and commented by a Chinese, and espoused as a system metaphor by an American. In a matter of seconds , many long seminar days acquired for everybody in the room a vivid meaning and a long lasting impact, of which this book is a testimony” Claudio Ciborra, Intern. Workshops on Cooperative Knowledge Processing for Engineering Problem Solving. LII, Trento, 1991-94. (The Italian was Claudio Ciborra, the Chinese-American Mitch Tseng, the American Arthur Baskin).

¹ Each concept of the list, put forward by Ciborra as useful in IS, was intended to produce thought sedimentation, and eventually promote a specific autopoietic mechanism in researchers of the community.

2.2. LII: University Laboratory of Information Engineering at Trento, Italy

LII is a peculiar entity, now closed, that has been striving for its (reason of) existence in the fabulous revolutionary times of the advent of electronic computers. Founded by an Italian Physics professor, who started as experimental physicist, then turned into a heavy user of supercomputers in theoretical physics: numerical experiments with molecular dynamics simulation methods of many body problems in liquids and solids – merging extreme abstraction with engineering problem solving -, “volunteered”, as many Italian university computer user physicists, to move to the disciplines of Information Engineering and Computer Science at the end of the '80s, due to shortage of academic personnel in the new discipline of Informatics. During the '80s he held an additional summer position of visiting adjunct professor at the Supercomputer Applications Center, at the University of Illinois at Urbana Champaign, where Ryszard Michalski was pioneering Machine Learning at the time. Not trained in Computer Science, pulled to take care of Trentino local industry's new computer users in difficulty, he found himself in a few years to have become expert of tech user problems, a legitimate research field at the time almost exclusively in Scandinavia (in fact, he frequented Scandinavia, and, in 2006, he chaired the Participatory Design Conference at Trento, the first edition of PDC to be held outside of Scandinavia, or the US). Two notes should be added about the change of discipline of the professor of Physics: one, the change was welcome, because the advent of computers was promising a new revolutionary era, while revolution in physics seemed to belong more to the twentieth century, than to the twenty first one; the other, the professor had learned that method is the most fecund asset for research: it had served well its scope in his physics research (e. g., the equal a priori probability in phase space at equilibrium, as a research tool in statistical mechanics), he counted method would serve its scope in information engineering.

LII took off. In the early '90s, LII has been the major university winner in Italy of research funds from the III and part of the IV Framework Research Program of the EU - more than the Politecnico of Milan - in ICT, manufacturing industry, agriculture, tourism. At that time, visits to Italy of EU officers of the Research Framework were paid to Trento most often than to other places. In those years, during a EU G6 meeting held somewhere else in the world, the online official communication of the meetings was broadcasted from LII rooms in Rovereto, precursor of an Internet like connection, by LII staff S. L., R. L., and G. B.. In those years, remote villages in the Trentino mountain valleys were experimenting a very unstable video online meetings software tool between municipality fonctionnaires, broadcasted from LII, precursors of Skype type applications, to share precious limited administration competences. One day, a call from the Rectorate regarded a visit from an envoy personnel of the US FBI, who was inquiring the Rector on why somebody from the University of Trento (it turned out to be a computer technician of LII: W. C.) had cracked the firewall of NASA ... LII was in-meshed with a University three years diploma on Information Engineering; with training course activities and tech transfer to local enterprises co-financed by the EU and by the Regional Government. A crucible of research, education, training, on tech innovation, mixing professors, students, industry personnel involved in teaching, all focused on innovation: a technical innovation that immediately involved organizational issues, and clearly demanded conjugating tech and organization competences together, both from the

lab personnel and from the personnel from client organisations and enterprises. It profited of the jumelage or twinning connection between the International Doctorate on People, Computers and Work at Trento, with the analogous Doctorate course at the Informatics Department at Oslo. The one founded by Kirsten Nygaard, the inventor of Object Oriented Programming. The same responsible of Participatory Design project Utopia launched at the end of the '80s together with the Labour Syndicate of Industry in Norway, to see to it that the introduction of computers in companies would not profit only capitalists, but would improve the work life of workers.

LII financed five PhD doctorate scholarships of that PhD course. It also founded four spin-off companies.

As a University of Trento articulation, LII eventually moved from Engineering to Sociology, to address directly disciplinary theory and practice issues at the interface between ICT and the Sociology of Organisation. It enjoyed continuous, precious, long term, international, major intellectual contributions, during those years, from eminent academicians: computer scientist Professor Arthur Baskin from Michalski's group at Urbana-Champaign (US); from the social study of information systems expert Professor Claudio Ciborra, a colleague at the same Department at the University of Trento, Professor Alessandro D'Atri from Rome, Professor Liam Bannon from Limerick, Ireland, Professor Peter Bednar from Lund, Sweden, and Professor Ina Wagner from Vienna, Austria; from the social informatics expert Professor Mike Martin from Newcastle, UK; and from anthropologist Professor Theodore Barth, from Oslo, Norway; from Colleagues at Trento Professor Giolo Fele ethnology, Professor Silvia Gherardi sociology of organization, and Professor Umberto Martini digital economy of tourism; from Professor Gian Piero Quaglino psychology of training, from Torino. And, finally, from EU Commission Research Framework fonctionnaires, one responsible for agricultural informatics, Directorate-General VI, Dr. Val Reilly, from Ireland/Brussels, and two from Directorate-General XII, science, research and development, Dr. Ezio Andreta and Dr. Giuseppe Valentini, from Italy/Brussels.

LII published in 1998 a description of its activity and role in society, indicating its ability of self-reflection, entitled: *Adaptive support for Enterprise innovation: Profile of an agile Training Organization* [11]. Research is the comminating trait of LII: "We are best fit to tray what nobody knows how to do, because we are researchers". LII avoided to specialize in one of the comparts of the discipline that it visited in succession: CAD, CRM, e-Learning, e-Government, Health Care, Civil Protection. It went for ever new challenges, attracted by the ever new complexity of digital endeavours.

These facts are relevant to frame the narration about the cognitive life of LII, and appreciate that the Lab had undergone the relevant situation of receiving from its world context the impact of major stimuli related to the then starting (Personal Computers) and afterwards ongoing (Internet) digital transformation, during its trajectory. And to trace back to these very facts the subjective influences that shaped its course.

As a side institutional observation about University functioning: we note that LII was self-sustained economically, thanks to EU project funds; it was made up of some 25 in-and-out circulating young people, mostly under training, holding temporary positions; with middle management consisting of a diploma on informatic engineering as Lab director, D. C., three researchers, M. R., V. D., M. M. (migrated from the Physics period of the Lab founder,

which eventually became associate professors), and a Rogers-ian counsellor, C.C., lent and temporarily detached from the school world. LII received protection from the Rectors, but few human resources as positions from Departments: one researcher (G. S.). LII did not survive the retirement of its founder.

2.3. Illustrating Concepts of Philology and Hermeneutics, basic for this article

The first concept: *Autopoiesis*.

We refer to cases of bias in human perception. Perception experiments on vision in frogs and in humans brought Maturana and Varela - two phenomenology poised biologists - to introduce [1] the notion of *autopoiesis and cognition*, as the realisation of the living: constituent processes are auto produced by living organisms; this ability being the peculiar defining characteristic of the living. The processes affecting perception described by Maturana and Varela consist of *reflexive feedback mechanisms* in living systems, influencing cognition and behaviour. A case of *second order cybernetics*.

"Living systems are cognitive systems, and living as a process is a process of cognition. This statement is valid for all organisms, with or without a nervous system." [1]

So, all living organisms, individuals or groups, continually produce constituent processes useful to them, reflexive in nature, that interfere with their perception of the world. So that in fact, they construct their own vision of the world, beyond what would be given by non-biased senses. To the point that the presence of a fly and a hallucination become indistinguishable stimuli to the frog.

The question then arises, are these naturally produced bias in living organisms, confined only in the sensorial biological domain, and influence then only the early stages of cognition, i.e. perception, of individuals? Or they proceed to affect in full cognition and behaviour, both of individuals and of communities?

Lots of room for the appearance of *reflexive feedback mechanisms* in the social. Reflexivity refers to circular relationship between cause and effect. An act of self-reference, where the perceived object acts back onto, and affects, the subject's perception affordance, thus modifying the very result of the perception.

Do we have examples of the existence such characteristic processes in our life, and in the life of communities and societies? Examples clearly demonstrating autopoiesis of societies? Outstanding auto-produced processes, for their survival? Of course yes, we are used to the concept of the culture proper of organizations, and of societies. The social construction of spoken language is perhaps the most outstanding example. And, the very construction of cities, an astounding constant, in the whole of human history.

The second concept: *Nature is not about codes: we observers invent the codes in order to codify what nature is about.*

Let's start our journey with the question whether we can regard as a living organism the community of participants to a research laboratory, and assign to it the autopoietic ability of auto producing its constituent processes. Let us quote on this the opinion of the British cybernetics scientist Sir Stafford Beer, in the preface to "Autopoiesis and Cognition" of Maturana and Varela [1], interpreting the book's general importance:

"This small book is very large: it contains the living universe... ... What I am now sure about is that they are right. Nature is not about codes: we observers invent the codes in order to codify what nature is about. These discoveries are very profound. ...

... scientists can no longer claim to be outside the social milieu within which they operate, invoking objectivity and disinterestany cohesive social institution is an autopoietic system – because it survives, because its method of survival answer the autopoietic criteria, and because it may well change its entire appearance and its apparent purpose in the process. As examples I list: firms and industries, schools and universities, clinics and hospitals, professional bodies, department of state, and whole countries." [1]

So, in front of "any cohesive social institution" we should remember that "Nature is not about codes: we observers invent the codes in order to codify what nature is about".

In front of three decades of cognitive biography of a research lab, we should not ask whether that cohesive social institution be in fact an autopoietic system, displaying autopoietic mechanisms, whether its method of survival in fact answer the autopoietic criteria; we should, instead, just identify the codes: we should just identify the apparent autopoietic mechanisms displayed by that cognitive biography, mechanisms that characterise the nature of that research lab. This second concept will be enacted in the present research work, along with the next one, the third concept:

The third concept: *What is phenomenological understanding?*

The answer to this questions we take directly from Heidegger's notes [2], it serves to reveal the human scientific methodology employed in the present study:

*"Understanding - as intuition - goes along with and into the fullness of a situation... The phenomenological understanding is nothing else than an intuitive going along the meaning. It must stay close and present to the total situation of the phenomenon... Capacity to accompany - being intimate, "love". Love as motivating ground of the phenomenological understanding - given necessarily in its sense of enactment." Heidegger is aware of the difficulty of carrying out this task with this method: "The first task is therefore the appropriation of the situation in which understanding is rooted; the full, concrete appropriation is by itself a task that will perhaps exceed the powers of the present generation... Those who attempt something else mistake in principle precisely what should be their aim...*the pure cognition of the labyrinthine basic character of human existence.*" [3] (our emphasis).*

Also this third concept will be enacted in the present research work.

Reader: please enter the magic realm of phenomenology, please be prepared to enact immediate intuition!

PART I – REFLECTIONS ON SUBJECTIVITY

3. Phenomenological Observations on Human Sense Making: Subjectivity of the Meaning People attribute to World Things

Amedeo Giorgi's analyses the phenomenological enquiry into subjective acts, confronted to the objectivist enquiry of normal scientific analyses [12]. According to him, phenomenology is the only philosophical basis of science capable of taking into account " ... *the intricate and rich nuances of individual experiences and the meaning people attribute to their encounters with the world*". [12] "The ultimate outcome of phenomenological analyses are eidetic expressions concerning the meaning of experiential events. What phenomenology adds to normal scientific analyses are the probing into subjective acts that are the correlates of worldly presentations." The term "correlates of worldly presentations" refers to "the inner experiences that correspond to, or are associated with, the external events or phenomena that we encounter in the world. Phenomenology recognises that our experiences are not just passive receptions of sensory inputs, but they involve active interpretation and consciousness. In mundane terms: the last statements emphasise how phenomenology contributes a unique perspective to scientific analyses, in contrast to more conventional scientific approaches. It focuses on understanding and exploring subjective experiences, particularly how individuals perceive and interpret the world around them. In "normal" scientific analyses, researchers often prioritise objective, measurable, and quantifiable data. They aim to uncover patterns, relationships, and general laws that apply to a broader population. This approach tends to overlook the intricate and rich nuances of individual experiences and the meaning people attribute to their encounters with the world". [12]

3.1. The Subjective path to Human Sense Making: Reflection creates Sedimentation of Personal Knowledge

What is the origin of subjective experiences? Different individuals have different thoughts, and perceive and interpret differently the world around them. Reflection is one of the causes. To rethink and reflect is important, say Peter Bednar and Christine Welch [13]: "We ... believe that it is both necessary and desirable to revisit and discuss again topics of significance. Only through reflection upon our own past work and that of others can we build productive learning spirals. Only in this way can we establish and extend a reflexive relationship to future practice."

The defining characteristic of human consciousness in engaging with the world is the intentional focus on a specific object – a foundational premise, see for example Giorgi [14]. Reflecting on the object produces sedimentation of subjective thoughts. Let's go back to the very beginning of phenomenology, by recalling Schutz, as done, again, by Bednar and Welch [15]: "When elaborating upon 'meaningfulness' Schutz (in Wagner [16]) questions how it is possible for any mutual understanding or communication between people to take place ... He reflects that such possibilities can only be approached via 'sedimentation' of preinterpreted experiences built up through conscious life. Any justifiable methods for interpreting social interrelationship must then be based on careful description of underlying assumptions and their implications. He goes on to suggest that the methods of the social sciences cannot be regarded as adequate to this task. ... They require a

philosophical analysis. And phenomenology ... has not only opened up an avenue of approach for such an analysis but has in addition started the analysis itself (in Wagner [16, p.56].” Note that, at Schutz times, human sciences performed with the objectivist epistemology of natural sciences. Bednar and Welch then go on: “This concept of a ‘sedimentation’ of pre-interpreted, lived experience comes about, for Alfred Schutz, through re lection. ... Thus, meaningfulness can only be attributed in retrospect. ... ”

Re lection creates sedimentation in what we may call personal knowledge, that is, the individual tacit ability to read meaning in a situation, from details around a focus [17],[18]; sedimentation is personal, different individuals encompass different sedimentations; mutual understanding in communication between people is complicated by their different sedimentations, hence different personal knowledge hence different assumptions hence different meanings in confronting the same situation: in one word, subjectivity. Contributions to any human science, that involve facts in the conscience of different people and their interrelations, cannot be safely made without explicitly considering subjectivity and the different sedimentations hence assumptions.

Conscious re lection is not the only source of sedimentation: humans are naturally equipped with autopoiesis [1, 19], i. e., the faculty of generating by evolution for better survival special mechanisms apt to tacitly create sedimentations directly from experience, without conscious re lection. Sedimentations are called, and act as, prejudices.

3.2. Sharing in a Community of Practice

As they come from different individual experience stories, different individuals unavoidably possess different sedimentations, hence different personal knowledge, and unavoidably assign different meanings to the same situation. Unless they undergo a communal cleansing process through sharing reflections on their different assumptions, in some community of practice. The authors Bednar and Welch in [15] link Shutz's first thoughts on phenomenology to early thoughts on information systems, formed in a sociotechnical perspective: “In considering Schutz's view, the authors are reminded of the work of Börje Langefors, in the mid Sixties, with the Infological Equation [20]. Reflecting on the nature of information systems, Langefors suggests that those people who are to interpret data in order to inform themselves must be viewed as part of the system. ... Meaning (information or knowledge) is thus created by each individual. Pre-knowledge ... is considered to be created through the entire lived experience of the individual concerned (cf Schutz's concept of ‘sedimentation’). .. He observes that communication may be seen to approach success most closely where individuals interpreting the same data belong to a group, definable for example by ...common professional interest, e.g. standardized accounting data among accountants.” [21] Within a group, members engage in recurring exchanges of thoughts, facilitating the sharing and sedimentation of ideas. This phenomenon enhances communication efficacy among group members, setting them apart from others. Psychologist Daniel Stern calls this the power of Interpersonal Dialogue [22]. Consequently, communities of practice stand out as unique entities where shared historical sedimentations foster robust communication, nurturing collective thinking and reinforcing the social construction of novel ideas. Thus, each a community of practice [23], [24], represents a distinct social milieu following a bespoke intellectually constructed path. So,

when considering facts-in-the-conscience of group members of a given community-of-practice regarding their professional subject matters, we are reassured by their personal professional knowledge that their conscience correspond to reality, by their consuetude with it, and their reiterated, shared, reflected upon, sedimented experience. See Ciborra's *Formative Context*. [25]

PART II - HERMENEUTICS OF A COGNITIVE TRAJECTORY

4. Subjectivity in Science in the Making, in Socio Technical Research

Now, it is all very clear. Now we are ready to start this paper. With a last caution: subjectivity plays leapfrog; the subjectivity of a community resides both in the meaning of the social action in single events, and in the meaning of the overall trajectory of the social process undergone by the group.

In the next two Sections, we will explicitly recall, and clarify for ourselves, Bednar and Welch's anticipated critical system thinking. We will delve some of the activities of "the Italian School of IS" that they mention, emphasising the driving intention of its members as they transition from various forms of Participatory Design [30]-[33], to Social Practice Design [4]-[6], ultimately reaching Giorgi's DPM [26], [27], and Martin's Neo-Socio-Technical [28].

Where do we find or observe the significance of people's subjective experiences within the Sociotechnical Research (STR) narrative, spanning the past half-century or so? We look for the *intention*: Husserl says that meanings are initiated by *intentional* acts: " ... the basic intention in which the experience from the outset aims at the object ...". [29, p. 17] Just examine how subjectivity has impacted the overall meaning of the social scientific process in the ST CST thread: in the relevance of the intention of *servicing the needs of the people*, besides fostering technology use.

4.1. Subjective Experiences in the Sociotechnical Research Narrative

Bednar and Welch in [7], [8] read the STR story through the lens of the "critical system thinking" dimension: the *intention* to bring about beneficial change for the people (a socially shared intention of some community of practice, if we consider groups): "Many scholars have attempted to define and encapsulate the essence of a "critical" dimension in research. This dimension goes beyond interpretation of social phenomena, and seeks for understandings that could support efforts to bring about beneficial change ... critical systemic thinking, exemplified by Gregory Bateson and Claudio Ciborra. Critically-informed research from a systemic perspective involves a desire to explore the unique and to question assumptions. ... we can see different philosophical approaches to design reflected in various information systems (IS) development methodologies. As an example of an early interpretive, sociotechnical methodology for IS analysis, effective technical and human implementation of computer systems (ETHICS), supports a democratic process of bringing about change (Mumford). ... Other methodologies, such as the soft systems methodology (SSM) (Checkland) ... requires reflection on individual perspectives. ... Multiview as a

methodology combines several approaches into one (Wood-Harper). ... both sociotechnical and participatory design approaches ... a paradigm shift is apparent in both managerial practice and academic discussion in recent years efforts to move away from a perspective of management as direction and control, towards one of management as leadership and dialogue... to focus on the way people understand their work as a fundamental key to performance. ... a more interpretive approach where people are empowered to “understand” in work by Ciborra .. especially where he is questioning claims on human rational practice.... a mood pervading the Italian School of IS ...e.g. social practice design involves efforts to support participating organizational actors to become change agents in their own environment. This provides a possibility for participants to create visions about problem solving and thus share in ownership/visions of solutions (Cattani and Jacucci ...). ... Resca and D’Atri ... discuss how business operating in electronically-enabled markets can act as value makers, entering into relationships of co-production and co-design with individuals and other companies who are their suppliers and customers.”

Subjectivity and intention—perfect elements for phenomenological studies. It's worth noting that all the Italian groups mentioned here were enjoying - among other affectionate ones - the enlightening and indelible intellectual influence of the late and deeply missed Claudio Ciborra, an admirer of Martin Heidegger's phenomenological ideas and hermeneutic methods. These individuals, through their personal knowledge, have participated in a meaningful social process. They reflect on it, as in this paper.

4.2. Trend and Revolution in an STR School

Life within ST research continued, and its trajectory has been a subject of investigation, for example by Peter Bednar and Christine Welch [7], [8]: “...(We) explore a particular philosophical underpinning for Information Systems (IS) research – critical systemic thinking (CST). Drawing upon previous work, the authors highlight the principal features of CST within the tradition of critical research and attempt to relate it to trends in the Italian school of IS research in recent years, as exemplified by the work of Claudio Ciborra but also evident in work by, e.g. Resca, Jacucci and D’Atri. ... This is a conceptual paper which explores CST, characterised by a focus on individual uniqueness, and socially-constructed, individual worldviews as generators of human understanding and knowing. ...”

Indeed, *individual uniqueness and socially-constructed individual worldviews, which serve as sources of human understanding and knowing* (subjectivity!), are exactly how a novel, intention-driven line of work began at LII. The line of work in question focuses on innovation within organisational interventions and originally encompasses contextual design, participatory design, user design, and user design in use. Let's take a look at its progression and its ultimate direction.

First Participatory Design (PD) and Language Action Perspective (LAP): *The language action perspective approach to system accountability for end user configurability: a new perspective on ICT development* [30], [31] that appeared in 2002-2005. Again LAP and PD blended together in what has come to be called DEUDU: *Use of use cases in Design for End User Design in Use* (again accountability for end user configurability). [32], [33] Both around 2002, well before Apple introduced the App Store for their smartphones on July 10, 2008.

Apple *Apps* realise precisely accountability for end user configurability, by standardizing use cases and familiarizing users to them at interfaces.

Then the Social Practice Design (SPD) proposal emerged with the 2007 paper: *Paths to organisational change based on counselling and phenomenology, using Rogers' human actualising tendency, and Ciborra's improvisation, mood, and bricolage* [4] (see also [5], [6]). Innovation instances actually enacted in an organisational intervention, thanks to the presence of an external agent, just as recommended by Ciborra and Lanzara in: *Formative contexts and information technologies: understanding the dynamics of innovation in organizations* [25]. SPD goes beyond PD. SPD in 2008: *A second step back for managing ambiguity besides reducing uncertainty* [34], [35]. Double loop learning instances were identified in an SPD organisational intervention in a paediatric clinic, entitled: *"Double loop learning elevates the innovation design of a paediatric clinic from media to intersubjective dialogue"* [36], where attention to intersubjective dialogue emerged, as a social practice of central role in the new organisation of work. .

Then, always in the clinic, the need for the Evidence-Based Proof of the DIR treatment came to the fore: *"We know it is real", harvesting consciousness with a descriptive information system* [37]. Provoking the bursting out of a Giorgi's DPM revolution in ST IS research: the quest for a methodology granting scientific rigour, able to extend the concept of Evidence Based Practice to include subjective evidence (opinions!).

Finally, the strive for TGP, the Trustworthy Governable Platform, overcoming Data Processing and Distribution paradigm, to the Information Communications one. [38] -

Is there a meaning to discover and unveil, in this succession of clear events?

Of course, latent precursors of each new focus were visible years in advance w. r. t. the actual bent in cognitive trajectory. Attention to phenomenology, subjective daily life aspects, and people's opinions, was prompted by Ciborra's influence years before the occurrence of the third bent of "harvesting consciousness with a descriptive information system"; and the need to stop talking about system integration, to turn towards system confederation, in multi-agency contexts, e. g., in a civil protection project involving at the same time health care, firemen, police, local administrations, and forest guards, was prompted years before of the occurrence of fourth bent towards "a trustworthy governable platform". But each cognitive bent acquires a clear identity, as soon as the new object of intervention focus acquires the substance of an official project, and/or is object of a scientific publication.

5. Identifying Subjective Inclinations of the LII Community

In pondering Claudio Ciborra's call for a human renaissance within the realm of the Social Study of Information Systems (SSIS) [10, p. 9]: *"... I want to contribute to a transition of the field towards an age of the Baroque in the deployment and management of technology in organisations and society"*, a question emerges. Reflecting on which aspects of science in the making should be inspected, looking for signs of a human renaissance, we ask: *"What insights can we gather regarding the influences shaping the evolution of a research group's narrative?"* To explore this query, our focus shifts towards the interplay between each

specific research endeavour undertaken by the specific research group, and the overarching trajectory of that group over time.

This paper introduces, illustrates and discusses, the interpretation that the influences shaping the evolution of a research group's narrative can be traced down to the *autopoietic sedimentation of a handful of key ideas immovably rooted in the conscience of key group members*; an interpretation twin to the one that Peter Bednar and Christine Welch have termed "*individual uniqueness, and socially-constructed, individual worldviews as generators of human understanding and knowing*". [7], [8]

Drawing from phenomenology, we learn that the defining characteristic of human consciousness in engaging with the world is the intentional focus on a specific object – a foundational premise, see for example Giorgi [12]. For instance, the intention of an SSIS research group might initially lean towards *critical system thinking* [7], [8] innervated into *Ciborra's humanistic Participatory Design (PD) approach*, under the subjective influence of a group leader, and towards *therapeutic co-construction with Carl Rogers's counselling* [39] under the subjective influence of another leader. This subjective group choice materialises in an inaugural research project, serving as a springboard for subsequent social constructions within the community of practice, sustaining the pursuit both of the critical system thinking, and of Rogers-ian counselling. Over time, the sedimentation and accumulation of past ideas, a ubiquitous aspect of human cognition, makes subjectivity evolve into a shared group trait, persisting throughout the group's research journey as a recognisable subjective thread manifesting in incremental advancements along a specific group trajectory, in social informatics interventions for organisational innovation.

In essence, the interplay between individual projects and the group trajectory embodies a dynamic of intertwined subjectivities: a game of leapfrog. We are urged to take subjective processes seriously—a response to Heidegger's poignant inquiry: "How do we teach each other speak objectively about these subjective things?" [40]

We are brought to look for links between premises and outcomes in the science in the making process. Again, we value the observation of Peter Bednar and Christine Welch [7], [8]. *approaches characterised by an emphasis on individual uniqueness and socially-constructed individual worldviews as sources of human understanding and knowing*. Let's enter *in medias res*, and visit in detail one individual worldview of LII, as source of human understanding and knowing: *Social Practice Design*.

PART III - AUTOPOIETIC MECHANISMS OF REFLEXIVE FEEDBACK

In this Part III, we shall first expand the discussion on the *continuity* aspect, over a couple of decades, of the culture of LII, as a change-support-group. We refer to the specific approach for change instillation and support of client's culture, involving second order governance and therapeutic co-construction: the SPD approach. It deals with the time *stability of the intervention scheme*: a conceptual characterisation of the two or three dozen SPD intervention projects that LII reported in the literature during its lifetime. We reference a comparison of the SPD scheme with precursors and alternatives. [44]

We shall then expand the staircase of four successive change steps, undergone, for external pressure, by the *type of action* of its change instillation and support-work. It deals

with the *change of the innovation focus*: the four major bending points of the LII cognitive trajectory on innovation, when, under pressure from the context, it focused on ever new concepts, making say that “modern technical systems embed “Shi”: because they are “connecting the notions of systems, change, organization and action, as they consist in “platforms for supporting new organisations, new frames of mind, new implementation strategies, new designs between people.

6. The SPD (2005-6) Action Research Intervention Scheme, stabilised by a first Autopoietic Mechanism

Along the path of LII in supporting IT innovation in ever new organisations and enterprises, we observe a clear emergence and definition of a specific *action scheme* for organizational interventions instilling and supporting change. An action scheme that then persists to the end without further modification: the Social Practice Design approach (SPD). An aware, effective and efficient organisational intervention approach, addressing the cybernetic third order of human activity, with therapeutic co-construction of *How questions, Visions of solution, and Intervention*. SPD is illustrated in some detail in [45]. A brief review of Social Informatics Intervention schemes is found in [46].

At the time of EU research project MAPPER [41], LII’s proposal of Social Practice Design, “i.e., the design of social practices – in itself a social design activity -, seeks to ensure that the potential benefits of novel technologies can be realized, by increasing the bias towards the social in Information Systems Development (ISD). SPD is a form of intervention research or action research based on counselling. It can be considered an extension of Participatory Design (PD) to the implementation phase of information systems. It regards the concept and participative introduction of new things to do, or of new ways to do things, by humans, in order to make place for technology, as Pelle Ehn said in 2006 [42], and in order to resolve a variety of other pending social problems in the organisation, at the same time” [Jacucci, 4]

SPD has accompanied LII all along without changes. At least from the year 2000, following a first 10 years of “incubation”. The persistence in continuity of SPD, over the years, can be easily exposed by a simple coding of the description of the action scheme used by the Lab, in four different LII’s published intervention projects, covering two decades. [43] The four intervention cases of which the published text are analysed hermeneutically, regards interventions for:

1. *Introducing digital innovation in a Non-medical Paediatric Clinic [36] 2019*
2. *Launching an Online Marketplace for a tourist destination [47] 2014*
3. *Organising Digital Services for Elderly Citizens of a municipality [34] 2008*
4. *Promoting a Tourist Destination Management Organisation [48] 2000*

The text of relevant parts (abstract and/or introduction) of the publications relative to the four intervention projects are skimmed and confronted with the six codes representing exhaustively the different elements of the SPD approach:

- YELLOW Innovations: critical system thinking of innovations: Participatory Design having the the additional objective of pursuing the good for people*
BLUE Counselor: External facilitator performing Roger’s advocacy of client’s “actualising tendency”: non-judgemental unconditional acceptance, empathy,

congruence

GREEN Double loop learning: Cybernetic third order intervention producing double loop learning – a new formative context for action

RED Ethnography

VIOLET Therapeutic co construction

GRAY Ciborra's concepts: pathos, improvisation, drift & bricolage, mood.

The text of the abstract and/or introduction of each of the four intervention projects object of the analysis [43], are all found to be composed of sentences falling on these six codes only, all six codes populated.

We maintain that LII choosing to keep constant the same action scheme, its own identitarian trait of SPD's third order intervention and therapeutic co-construction, can and should be read as the effect of a reflexive feedback mechanism, a subjective feature evolved during the LII parabola, and eventually in-meshed in LII cognition: an autopoietic mechanism. Sometimes partly self-aware and intentional, most often instinctive and spontaneous.

SPD is a useful intervention scheme for modern technologies, as it embodies "*Shi*": *an holistic conceptual platform for supporting new organisations, new frames of mind, new implementation strategies, new designs between people*. Our point is that precisely because it embeds "*Shi*", and it is useful in modern technological times, it has been chosen by LII more or less consciously as the identitarian intervention approach, and kept unchanged in continuity thanks to a group autopoietic mechanism.

7. Bents in the *Focus Trajectory* of LII embodying "*Shi*", selectively enacted by a Second Autopoietic Mechanism

The adoption of SPD as the action scheme, is in itself a change of focus in the action and cognition of LII. One of the four main focus changes we are counting. Let us identify them. We have argued that the *intention* of an SSIS research group might initially lean towards *critical system thinking* [7], [8] and *Ciborra's phenomenology concepts* under the subjective influence of a group leader, and towards *therapeutic co-construction with Carl Rogers's counselling* [40] under the subjective influence of another leader.

These subjective group choices materialise, from the non-discriminating availability to *address user needs*, in a new, inaugural concept style of the Lab research projects – the first *bent* in the cognitive trajectory -.

Serving as a springboard for subsequent social constructions, sustaining the pursuit in user centred design both of critical system thinking and Rogers-ian counselling. So much so, that - as pointed out in Section 6 - after a while the elements of the very intervention approach materialise into the definition of *an entirely new way of doing things*: the SPD approach, the LII way to organisational intervention - the second *bent*.

In subsequent years, the LII cognitive trajectory showed other two *bents* - four in all -.

Ending up, in one, indicating the concept of *community of practice* as the crucial add-on to the descriptive phenomenological method, to successfully perform *scientific query experiments, based on shared opinions*. [37] And, in the other, underlining the central role of

the concept of *accountability as theory-in-action* in our work (we need a more accountability prone information communications paradigm). [38], [49]

Along LII's consistently oriented journey, and in each and every one of these *bents* of cognitive and action trajectory (PD and user centred design, social practice design, descriptive phenomenological method, trustworthy governable platform), we observe both the *persistence of character* of the intervention scheme (third cybernetic order and therapeutic co-construction), during the vast *change of focus* of the meaning for LII of its action on modern technical systems: platforms for supporting new organisations, new frames of mind, new implementation strategies, new designs between people.

This statement is supported by a simple analysis of the new innovation that produces each bent: just by coding the text of the description of the new focus, in the abstract and/or introduction of the relative published intervention. [44]

The *change of action focus* for innovation, in the four bending points of the LII cognitive trajectory inspected in Section 7, unavoidably leverages a new concept of *modern technology*, a concept *connecting the notions of systems, change, organization and action*, as consisting in *a platform supporting new organisations, new frames of mind, new implementation strategies, new designs between people*. A concept *embedding "Shi"*, we say, employing again the identitarian metaphor emerges in the early LII workshop.

Recognizing, one by one, the holistic trait of the few bents accepted, we maintain that the LII selectivity of choosing only focus changers embedding *"Shi"* as bents in its cognitive trajectory, can and should be read as a reflexive feedback mechanism, a subjective feature evolved during the LII parabola, and eventually in-meshed in LII cognition: an autopoietic mechanism. Sometimes self-aware and intentional, most often instinctive and spontaneous.

7.1. Change of Focus at LII as an Evolutionary Breakdown in ST Innovation

The successive focus change of the interventions, indicate sharp bents in the evolution of the trajectory of disciplinary attention areas of innovation demands within the ST field. The meaning of this process is that, at times, responding with availability to demands of a human sciences research field, the ST domain, opens up to a wide range of cultural interests. Let's freely characterize the different focuses of the four bents, in the order:

- A- Object: *(IS design), (ST intervention), (DPM for the human sciences), (information paradigm for ICT enabling accountability and AI navigation)*
- B- Object type: *Design (science of the artificial), Intervention (action research), Accountability (ethnography and ethnomethodology), Subjectivity (phenomenology of intention)*
- C- Object dimension: *design, action, method, intention*
- D- Discipline involved: *Information engineering, Sociology of organisation, Ethnomethodology, Hermeneutics.*

What do the four new focuses all share? DEUDU, SPD, DPM, TGP? The shared, central character of the new focus in each bents of the LII cognitive trajectory is their *holistic* trait: these game changer bents all involve at the same time the various *Facets of Innovation*, traditionally named *Organisation, Training, Technology, Business*. Let's term Training with *Frames of mind*, Technology with *Implementation strategies*, and Business with *Designs*

between people. We see that the holistic trait of the four bents embeds “Shi”. As shown in [44], each new focus entails all four traits, as shown in Fig. 2:

The “Shi”: <i>platforms for supporting</i>	DEUDU	SPD	DPM	TGP
<i>new organisations, : ...</i>	x	x	x	x
<i>new frames of mind, : ...</i>	x	x	x	x
<i>new implementation strategies, : ...</i>	x	x	x	x
<i>new designs between people. : ...</i>	x	x	x	x

Fig. 2: Checking the correspondence of the four attributes of “Shi”, against the features of the four innovation focuses of the cognitive trajectory bents.

Explicitly:

- DEUDU *Design for End User Design in Use*: users participate in design, LAP drives interface design, using interactive use cases, user needs are put at the center.
- SPD *Social Practice Design*: the external agent, the third order solicitation of innovation, a therapeutic co-construction of problem issues and solutions, a second step back by all.
- DPM *Descriptive Phenomenological Method*: community of practice members as data source, opinions as data for science in the making, information systems as scaffold for data acquisition, a new way to do Science.
- TGP *Trustworthy Governable Platform*: second order governance involving all stakeholders in multi-agency contexts, a new conversational information communications paradigm, the new ICT platform, reliable accountability.

8. Conclusion

We do not need to *prove* that research groups develop autopoietic reflexive feedback mechanisms in their cognitive life. Maturana and Varela have shown this. [1] We just need to *read* the presence of these mechanisms in the cognitive life of groups of our interest. Our hermeneutic interpretation generates *shared understanding*, eliciting and enacting “Shi”. [46] Our reading is *subjective*. Of course. Subjective but *useful*, if we strive for *phenomenological understanding*. We have performed an “intuitive going along the meaning, close and present to the total situation, with capacity to accompany - being intimate, “love” as motivating ground of the phenomenological understanding - given necessarily in its sense of enactment”. [2] “Those who attempt something else mistake in principle precisely what should be their aim...*the pure cognition of the labyrinthine basic character of human existence.*” [3] (our emphasis).

Organisations we see possess a fabulous subjectivist strength, in driving human and social intentions and inclination towards world-y objects, via the sedimented meaning assigned to these objects: the strength of the connection between autopoiesis and cognition. Our interpretation does not assign reality to these connections, we just read them: “*Nature is not about codes: we observers invent the codes in order to codify what nature is about.*” [1]

We see that the cognitive trajectory of LII appears dominated by the presence of concept of “Shi” in the minds of LII. Both the innovation focus of the various bents of the curve,

embed the concept of “*Shi*”; and the persistent action scheme for organizational intervention itself, SPD, embeds the concept of “*Shi*”. We are able to give substance to these interpretations, calling upon the *social autopoietic mechanism*, a biological reality, constituent of our very condition of living bodies as well as living social organisations.

Post scriptum

Re-reading this article, it is clear that the concept of *method* grows in it like a weed. Not openly, but between the lines. The explicit use of the word is grounded from Ciborra’s influence: Claudio as a provocation writes against *method* [10], meaning with the word *method*, in his critique, a rationalistic procedure built out of a fixed list of rigid, context independent steps. In the approach he intends to sponsor, Claudio focuses instead on the various aspects of the *situation*, even on the *mood* of the actor at its centre [50]. Claudio indicates that the traditional, scholarly kind of *method* is in crisis in the field of IS, if it is not the origin of the crisis. He strives for an age of the Baroque: “... *I want to contribute to a transition of the field towards an age of the Baroque in the deployment and management of technology in organisations and society*”. [10, p. 9] He convincingly maintains that, not *method*, but *pathos, improvisation, mood and bricolage* are the new ingredients, imported from ordinary life, enabling success in our scientific endeavour.

We agree. So, for example, we are careful to build SPD as a framework, *a situation dependent “formation context” for action* [25], nor a fixed list of rigid steps. And, we are careful, accordingly, to talk about an *approach*, not a *method*, for SPD.

OK, not a *method* then? Yes. But, but, but ...

- The clear, stable, insisted choice, in LII’s critical system thinking, of the identical approach along two or three decades, for cybernetic third order PD interventions based on therapeutic co-construction, cries out for use of the word *method*.
- The respect of a specific criterion – embedding “*Shi*” - for selecting in LII the particular occasional modern technology situations, worthy of accepting a new action focus for its cognitive trajectory, cries out for the use of the word *method*.
- The carefulness, in LII’s reasoning about epistemology, in confronting expectations for the natural science objectivist approach, with expectations – different, yes, but equivalent - for the subjectivist phenomenological approach of the human sciences, betrays and reveals an aspiration for *method*.

LII’s subconscious *autopoietic reflexive feedback mechanisms*, LII’s *culture*, the very *self reading* of LII’s cognitive trajectory, all must be soaked with *method*. Where *Conscious Self* forbids, Georg Groddeck’s *Subconscious Es* fixes. The power of an education in experimental physics: extreme abstraction, intertwined with engineering problem solving. *Method*.

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