Calculation and Classification as Dimensions of Social Interaction

Paolo Totaro[a],*

[a]Professor Instituto de Ciências Sociais, Universidade Federal de Alagoas (UFAL), Maceió, Brazil.
*Corresponding author.

Abstract

Cassirer interpreted the transition from medieval to modern theoretical thinking as an epistemological revolution which saw the concept of function to replace that of substance as a guide to knowledge. This article suggests that, in the practical world, classification into classes, types or genres is correlated to the concept of substance, while the concept of function is present in any practical calculation in the form of algorithmic procedures. The way in which algorithmic calculation and classification interact with each other has resulted in the preservation, expansion or loss of social interaction, understood as reciprocity between actors. The action of calculation and classification can then be used as epistemological coordinates to analyze social interaction. Such systematization results in a set of schemes presented in this paper along with ethnological studies supporting the theoretical model.

Key words: Algorithms; Classification; Social integration; System integration; Formal rationality.

INTRODUCTION

Ernst Cassirer (1922) focused on the transition from the concept of "substance" to the concept of "function" as a guide to knowledge, the division line between ancient and modern theoretical thought. The concept of substance which Cassirer makes reference to is that of the Aristotelian school, where the substance is the essence of an individual object in its concreteness. "Individual substance" implies a "realistic" epistemology, where the characteristics of all things in the world are independent of our knowledge processes: according to this philosophical view, attributes and properties are inherent to objects and not a result of the relations that a "knowing ego" builds based on his/her experience of reality. The objectivism of this conception forms the basis of Aristotelian taxonomies, in which objects and living beings are arranged according to similarities or differences in their properties and attributes (*genus proximum et differentia specifica*) in a hierarchic structure that goes from the "supreme genus" to its various sub-species. The tool of this arrangement and representation of the world is classification (Cassirer, 1953, p.5).

Instead, the concept of function as used by Cassirer does not focus on the objects or the relationship between them, but on the relation itself. According to his philosophy, the apparent objectivity of things is a result of relational activity and arises when constants emerge in relations. The origin of the apparent 'fixedness' and individuality of objects comes from these invariances within relations and the mind intuitively interprets them as "things" (Cassirer, 1955, pp.29-59). Thus, when theoretical knowledge is oriented by the concept of function, it does not focus on the essence of things but on the relationships between experiences. Calculation in particular, redefines the objectivity of the physical world in terms of "stable numeric relations" between quantitative dimensions (Cassirer, 1922, pp.377-417, 1955, 1953).

According to Totaro and Ninno (2014), the interpretation of the modern theoretical thought offered by Cassirer as a paradigm oriented to the concept of function is also applicable to the practical world. To understand the basis of this statement, we shall consider the fact that the

logic of mathematical functions is ubiquitous in modern life, where it comes in the form of algorithms[1]. Indeed, the theory of computation has determined that each algorithm is equivalent to an "effectively calculable" numerical function (see, for instance, Davis, 1958; Mendelson, 1964; Odifreddi, 1992). This means that whenever we execute an algorithm, for example, pressing buttons on a remote control, a computer, a technological device or when we carry out any practical calculation, we always activate the same logic, which is that of "effectively calculable" numerical functions. As we shall see below, the so-called "factory system" and bureaucratic organization also have algorithmic procedures as a reference and hence the logic cited above. On the basis of these observations, one can imagine how a "practical" action in the modern world is immersed in the logic of calculation. We will devote section 1 of this article on this topic.

Section 2 will demonstrate that calculation has favored social interaction (reciprocity between actors) when it is applied to merely quantitative dimensions. However, when it is applied to humans, previously reduced to formal elements through a technical use of classification, calculation generates a loss of social interaction. In the same section, computer-mediated communication is also considered. Section 3 will show that classification, when not used as a means to standardize humans, is an indispensable element of social integration. In section 4, we will use the epistemological categories of calculation and classification as coordinate dimensions to frame social interactions in the modern and contemporary world. Through this model, aspects that promote or inhibit social interaction in major modern or contemporary phenomena can be recognized. Finally, results from case studies compatible with this theoretical model are presented in section 5.

1. THE LOGICAL ORIGINS OF MODERN RATIONALITY: THE CULTURE OF CALCULATION

The common idea of calculation as a simple operation with numbers is misleading. In fact, the rationale of calculation is much broader than it seems: on the one hand, the formal theory of numbers has shown that all numerical functions of a given species (such as "effectively calculable" functions) are equivalent to recursive functions, on the other hand, the Church–Turing thesis has determined that the same correspondence exists between recursive functions and algorithms. In other words, an algorithm is always equivalent to a numerical function because both correspond to a common recursive process (Davis, 1958; Mendelson, 1964; Odifreddi, 1992).

Therefore, algorithms are based on calculation by number. Through algorithms, the logic of calculation has extended its scope from numbers to the world of 'things', since algorithms can manipulate objects that seemingly have little to do with numbers. For example, the set of rules that allow a performer, whether human or mechanical, to put a set of words in alphabetical order is an algorithm. Such an algorithm does not manipulate numbers but words. However, its logic is the same as that of numerical calculation. Through algorithmic practices, calculation has exceeded the cognitive scope of mathematics to enter the performative world. The penetration of calculation into the practical world goes far beyond what is intuitively perceived and what the social sciences have so far considered.

Totaro and Ninno (2014) claim that the logic of algorithms is the basis of modern rationality. They clarify that "monetary and capital accounting" (Weber, 1978, pp.86-100, 107-109) imply algorithmic activities, since they are based on processes of calculation, just like science and technology. Most importantly, these authors highlight that bureaucracy is also inspired by the logic of algorithms, despite the fact that it does not necessarily deal with numbers but with people and things. They identify common elements between recursive functions and bureaucratic processes, thus concluding that the latter is based on a substantial algorithmic logic. Let us consider their argument in greater detail.

Recursive functions are always based on three "initial" functions (see, for instance, Mendelson, 1964, pp.120-121; Odifreddi, 1992, pp.21-22). Two of these are responsible for providing the first term of the process (initialization), while the third, called the "successor function", builds up the process. More complex recursive functions are generated from the three initial functions by rules that preserve the logic of the successor function. The latter is therefore the cornerstone of recursive functions. It is an operation that acts on itself and its content is therefore its own logic. For example, the number 3 is given by the successor applied to itself three times starting from the number 0. That is, $1 = s(0)$ (successor of 0); $2 = s(1) = s(s(0))$; $3 = s(2) = s(s(s(0)))$. We can see how the successor is applied to the successor of the previous step. Another example is given in Set Theory (Mendelson, 1964, p.175). Here, at each step the successor function produces a new set which has as its elements the exact sets constructed in the previous steps. Thus, the successor of 0 (empty set) is $\{0\}$. The successor of the latter is the set formed by 0 and the new element, which is $\{0,\{0\}\}$. The successor of this is in turn $\{0,\{0\},\{0,\{0\}\}\}$ and so on. Thus, a recursive process, once initialized, is an operation whose content is the operation itself.

In administrative bureaucracy, continue Totaro and Ninno, the "ideal type" of performer acts as a mechanical element dependent on the process of the organizational machine (Weber, 1978, pp.973-975, 987-988). In the

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[1] Each process governed exclusively by formal rules can be called an algorithm.

factory system, the "detail laborer" also works as a cog-wheel in the machine represented by the organization (Marx, 1952, pp.177, 181-185). In both cases, which literature combines in the concept of the "bureaucratic model" (Weber, 1978, p.956), the human element develops a process similar to that of the successor function. Its primary purpose is performing an operation whose aim is the operation itself.

Demonstration of this is given by the fact that we intuitively interpret the bureaucratic act as "mechanical". There is no formal definition for "mechanical process" (Mendelson, 1964, p.207; Davis, 1958, p.XV). Nothing allows us to determine objectively whether or not a job is mechanical. However, when we think about the "detailed laborer" described by Marx, we immediately associate it with a mechanical act. Why do we compare a human being to a machine? The crucial point is not the repetition itself. For example, a craftsman who constantly performs a particular movement, having in mind the production of a finished object, cannot be seen as a man who works mechanically. However, if we interpret his repetitive movements as ends in themselves, as is the case of the "detail laborer", then we think of his actions as mechanical. The decisive step is when we interpret the repetition as an end in itself, giving the act a recursive connotation. As we saw above, we have a recursion when the content of an operation is the operation itself. Therefore, the bureaucratic act seems mechanical not because of a casual impression but because it is fundamentally recursive (Totaro & Ninno, pp.34-36).

In spite of modern science, the monetary economy and "capital accounting" being more distinctly based on algorithmic processes than bureaucracy, the epistemological process that made possible the application of mathematics to the physical and economic domains must be kept in mind for the purpose of our arguments. Before the birth of Galilean Physics, mathematics were considered a science of little practical usefulness. The perfection of its ideal objects was seen as opposed to the imperfection of material bodies (Galilei, 1980, p.255). Moreover, how could a language that only expresses quantities describe the 'real' world, which is so rich in qualitative differences? In answer to these two problems, one finds the crucial breakthrough that led to modern Physics (Cassirer, 1922): Space and time are two universal dimensions that belong to both physical and mental worlds. While they are present in all physical phenomena, they can be considered mere quantities and therefore completely reducible to mathematics. Thus, space and time[2] qualify as mediators - 'interfaces' as we could call

them today - between the 'mental' world of mathematics and the material world of physical reality (Cassirer, 1953, pp.117-119). Therefore, through space and time, mathematics can universally describe any physical phenomena.

Despite leaving its own domain, mathematics preserve a consistent use of recursive functions in this new application. As we have seen, the contents of recursive functions are their very own processes: Their "domain" is given by already recursive elements. Measurements of space and time belong to this domain, because they are in themselves recursive operations. A measurement of space is in fact a division (an arithmetic operation) between two parts of space, where one of the two works as a unit of measurement[3]. The same happens with time. In science and technology, we therefore have an application of recursive operations (calculable functions of science and technology) on recursive operations (measurements of time and space). Similarly, modern economic value operates as a mediator between mathematics and reality, since goods are no longer concrete objects but numerical values expressed by prices (Totaro & Ninno, 2014, pp.36-38). Thus, in modern science, technology and economics, the use of calculation is epistemologically consistent because it operates within its own domain, applying recursive functions onto recursive functions (see Table 1).

However, this does not happen with algorithms of the bureaucratic model. Here, recursive functions are not applied to recursive elements but to ontological constructs such as human actions. This is an epistemologically incoherent operation (see Table 1), since recursive functions are being used outside their domain. The consequence is that the "human factor" is forced to adapt to the logic of recursion. This fact is fraught with social consequences that will be analyzed below. Overall, the differences between the applications of calculation to recursive or non-recursive elements constitute the background of the theoretical interpretation of modern social phenomena proposed in this article.

2. CALCULATION AND ITS HYBRIDS WITH CLASSIFICATION

Cassirer (1953, pp.3-9) shows how the "generic concept" which refers to a class of things is antithetic to that of function. Classification treats individuals as objective realities with their intrinsic properties and attributes, which

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[2] Newtonian physics is based on the three dimensions of space, time and mass. But Mach (1919, pp.216-222) shows how well mass is definable as a ratio between accelerations. Since acceleration is a function of space and time, it may also be concluded that mass is definable in terms of space and time.

[3] For example, two segments only become a unit of measurement and a measured quantity when they are considered as the denominator and the numerator of a division. Without this, they are only ontological experiences. In other words, it is the function of division to transform two ontological experiences of space into a measurement. Furthermore, the practical operation in which a measurement consists is definitely recursive, since a measure is always the outcome of a definite procedure (Euramet, 2008), namely the result of an algorithm.

it uses to order and gather animals, plants and all things in genres and sub-classes. Conversely, the mathematical function produces the terms and their properties at the same time it arranges them. For instance, the properties of a curve on the Cartesian plane do not belong to the points it is made of but to their respective order. Let us consider, for example, a point of the function $y=x^2$. It does not have properties in itself: it is only a geometric entity without dimensions. But when considered as connected with all the other points of the function, according to the rule expressed by the curve, it acquires all the properties of a point of a parabolic function.

Despite the fact that calculation and classification present opposite means of ordering the world, modern rationality is largely characterized as a hybrid of both. This is the paradigmatic case of bureaucracy. Having as its objective the "calculability of effects" (Weber, 1978, p.975), the bureaucratic model uses classification to reduce ontological elements such as people and their activities to standard units that allow the application of algorithmic processes (see Table 1). For example, the first step in Taylor's "scientific administration" (Taylor, 1911) is "the identification of individuals by properties useful to the process, precisely to minimize all accidental characteristics of the person that are extraneous to the algorithmic operations to be performed" (Totaro & Ninno, 2014, p.39).

The use of classification to reduce ontological elements to units of calculation has been the source of a striking contradiction in bureaucratic organizations. From the empirical research of Roethlisberger & Dickson (1939) and from the reflections of Elton Mayo (1945), it became clear that "human relations" greatly affect productivity but cannot be controlled by the parameters of the factory system. Selznick (1948, pp.25-26) showed how the formal organization does not see the individual as a whole, because the technical classifications fail to represent their "social matrix". Human relationships, left out of the technical drawing, are free to create "informal relationships and groups" that influence the actual operations of the organization (Blau & Scott, 1962; Blau, 1956).

The problem of bureaucracy is its incompatibility with communicative interaction. In bureaucracy, it is necessary for human agents to remain within the boundaries of the categories in which they are classified and defined so that they do not obstruct the proper functioning of the algorithm. Communication is therefore considered a harmful and alien element to the process as it introduces elements of subjectivity and unpredictability. However, the impossibility of suppressing communication guarantees that informal relations will be created whatever. Attempts of technocracy to eliminate the informal element through exacerbation of formalization reinforce rather than eliminate the problem, since formalization is its cause.

This leads to the formation of "vicious cycles" which determine the "structural inefficiency" of the system (Crozier, 1963).

Calculation itself does not present this type of problem: when applied to numerical dimensions (space, time and value), it generates "abstract systems" that do not lead to vicious cycles or represent an impeding factor in communication. Instead, they allow social interaction between remote subjects. Like bureaucracy, they were instrumental in the dissolution of "communal relationships" during the course of modernization. But unlike bureaucracy, they have proposed new forms of social interaction within the geographically and temporally extended world generated by market expansion trends. Modern money (Giddens, 1990; Simmel, 2004), the "price system" (Hayek, 1945), the accounting techniques (Weber, 1978, p.92; Giddens, 1984, p.152; Crosby, 1997, pp.199-223), modern Physics, transportation and communication technologies all belong to such abstract systems and are based on calculation applied to space, time and value (see Table 1).

Following the terminology of Giddens (1990), we call 'time-space distanciation systems' those using calculation to allow socioeconomic interaction between physically distant actors. Here, calculation is a tool in the hands of people. Meanwhile, we will call "systems of logical distanciation" those in which calculation subordinates people by "encapsulating' them into a step of a formal process. Here, people are instruments of the systems. The designation 'logical distanciation' for the latter type of system was chosen to emphasize that the distance between individuals is not physical (space-time distanciation) but imposed by the algorithmic logic of the organization. In industrial or administrative bureaucratic organizations, there may be large numbers of people who work side by side while remaining isolated in the steps of the formal process. The main difference between the two types of systems can be summarized as follows: Time-space distanciation systems separate actors but allow remote social interaction, while systems of logical distanciation do not separate actors but hinder the social interaction between them.

Although bureaucracy is in essence a system of logical distanciation, it is not the only one to fall into this category. There is a form of consumption specific to contemporary society which presents the characteristics of such systems and has been described especially by Baudrillard (1998). The "logic of differentiation" in a "consumer society" is separated from the "logic of individual satisfaction" and acquires an entirely formal connotation. It does not refer to a specific position or status but to the difference in itself, giving it a positive or negative value without focusing on a particular point of comparison. It is pursued through a kind of calculation ("calculus of objects"; Baudrillard, 1998, p.27), in which

units are products and people. To perform this function, these units are pushed to converge into a single dimension in which they lose their ontological differences:

> Differences of the "personalizing" type no longer set individuals one against another; these differences are all arrayed hierarchically on an indefinite scale and converge in *models*, on the basis of which they are subtly produced and reproduced. As a result, to differentiate oneself is precisely to affiliate to a model, to label oneself by reference to an abstract model, to a combinatorial pattern of fashion, and therefore to relinquish any real difference, any *singularity*, since these can only arise in concrete, conflictual relations with others and the world. (Baudrillard, 1998, p.88)

The "calculus of objects" opens a contradiction between the need for "personal" satisfaction and the reference of this calculation, which is a "depersonalizing" classification. The renewed search for personalization through more consumption can only reinforce the dissatisfaction that one wishes to reduce and the use of the abstract system of fashion is the root of the problem, not its solution.

Like bureaucracy, the "consumer society" is classified in our scheme of analysis as a system of logical distanciation because it presents the three basic elements of this kind of distanciation: a) The coercion to regress to an abstract pattern through classification, which is in partexercised by the very individual who suffers its consequences; b) Isolation of the individual in a process whose repetition becomes a vicious cycle (the quest for personalization through standardization); c) The inability of the "abstract system" of fashion to solve this contradiction, reinforcing the problem instead. This conclusion about vicious cycles in consumption is beginning to be confirmed by empirical studies. Pieters (2013) found the existence of a vicious cycle between "loneliness" and a form of "materialism" understood as the type of consumption we are discussing.

The failure to make a distinction between systems of time-space and logical distanciation led Giddens to indicate only one social consequence of systems: "integration". In this way, his theory turns out to be incomplete. Giddens (1984, p.376, 377) defines social integration as "reciprocity of practices between actors in circumstances of co-presence" and system integration as "reciprocity between actors or collectivities across extended time-space, outside the conditions of co-presence". These definitions have little to do with the phenomenon of logical distanciation. The encapsulation of individuals in steps of formal processes and the consequent absorption of their actions by the rules of an algorithm exclude any "reciprocity" between actors, thereby impeding both social and system integration. Thus, the loss of reciprocity between actors caused by logical distanciation is absent in Giddens' theory. We will call this loss of reciprocity "system disaggregation" (see Table 1).

Table 1
Application of Calculation to Physical or Human "Reality" Through Recursive or Non-Recursive interfaces, Abstract Systems Belonging to Both Cases and Their Epistemological and Social Consequences

	CALCULATION APPLIED TO	
	PHYSICAL AND ECONOMICAL REALITIES	**HUMAN REALITY**
Interfaces between calculation and reality	TIME, SPACE, ECONOMIC VALUE (Numerical and recursive interfaces: belonging to the domain of recursive functions)	CLASSIFICATION (Non-numerical and non-recursive interface: not belonging to the domain of recursive functions)
Epistemological consequence	COHERENCE	INCOHERENCE
Abstract systems belonging to fields of	MODERN SCIENCE, ECONOMICS AND TECHNOLOGY	MODERN BUREAUCRACY
Social condition	TIME-SPACE DISTANCIATION	LOGICAL DISTANCIATION
Consequences on social interaction	SYSTEM INTEGRATION	SYSTEM DISAGGREGATION

Compared to both time-space or logical distanciation, computer-mediated communication (CMC) occupies a special place. We showed that in the first type of distanciation, calculation is applied to numerical dimensions such as space, time and economic value, while in the second, it is applied to ontological terms such as human beings in a bureaucratic model or in a particular form of consumption. However, when calculation is performed on a computer, it is applied to neither numerical nor ontological references but simply performs numerical functions that do not necessarily apply to a specific domain. It leaves the abstract world of mathematics and enters "reality" as a "live calculation". The World Wide Web is a concrete object distributed in concrete space and time but it is not an application of mathematics to time and space. It is this feature that makes Castells (2010, pp.441-443, 492, 494) state that on the World Wide Web specific time and space are created, distinct from concrete places and biological or chronological time. In other words, computers and CMC belong to the practical word because they simply reify calculation and not because they quantify a specific

domain of reality. It is this very independence of computers from a particular application that allowed Karp (2011) to propose the idea of "computational lens". Karp defends the fact that, in most human and natural sciences, phenomena are acquiring a new representation since computational systems are transforming the way in which the objects of these sciences are being formalized and considered.

> In many different fields of sciences, both physical sciences and social sciences, the basic underlying processes can be thought of as computational, and can be analyzed through the lens of computer science. The power of this computational perspective is multi-faceted: it exposes the computational nature of natural processes and provides a language for their description. (Karp, 2011, p. 576)

The fact that CMC does not have a specific application makes it appropriate for both recursive and non-recursive interfaces, respectively corresponding to numerical dimensions and ontological terms. As a result, calculation is capable of developing both system integration and disaggregation. CMC can reduce its users to simple algorithmic steps, placing them in a state of logical distanciation, but it can also be a tool in the hands of users for remote social interaction.

In the first case, the alarm raised by Lanier (2010) is justified: the 'clicks' that connect us to the network can easily be transformed from a command on an instrument into steps of formalized processes to which we owe obedience. In this way, it would be once again a meta-individual logic of an algorithm coordinating the actions of individuals. Unlike the bureaucratic model, here the subjection from an external order is incorporated by directly using the 'network' and is not imposed by a "hegemonic" center. Users are standardized and subordinated as soon as they adapt to the technical classifications implicit to the algorithm. Scott Lash (2007) defines this new form of power as "post-hegemonic". In the second case, as we shall see below, the Web presents a form of remote social and economic interaction where individuals, social groups and institutions abandon the "heteronomous" condition imposed by the bureaucratic model. CMC may favor both system disaggregation and integration, depending on whether or not the combination between calculation and classification that is typical of logical distanciation is present.

If calculation itself is a language and thus a communication tool, classification is also essential for communicative interaction as long as it is not used as a way of reducing human actions to calculable units. The next section presents an analysis of the role that classification has in the process of social integration.

3. THE INTEGRATING FORCE OF CLASSIFICATION

In *Philosophy of Symbolic Forms*, Cassirer (1955) analyzes the differences and contiguity between modern knowledge (based on the concept of function) and that of "mythical consciousness". This study is relevant here because it shows how the mythical view of the world is the origin of the ancestral classifications of human culture. The representations of the mythical-religious world originate, according to Cassirer (1955, pp.83-151), from primordial experiences of the human body posture and from that of light: even the main references of space, time and number in modern science had these same ontological and affective foundations in their mythical origin.

Just as there is a magical anatomy in which certain parts of the body are related to certain parts of the world, we have a mythical geography and cosmography in which the formation of the Earth is described as if it were a human body. The Earth is identified as a living organism whose parts represent the head, the diaphragm, the navel, and so on. Thus, the world has a 'top' and 'down', a 'forward' and 'back' (Cassirer, 1955, pp.90-93). The reference to the human body is intertwined with the experience of light in the alternance of night and day. The east and west, north and south orientations are based on the path of the sun. Thus, in most ancient cultures the division of space into seven parts (east, west, north, south, above, below and a center) is commonly used (Cassirer, 1955, pp. 94-102).

Time is perceived in a similar way (Cassirer, 1955, pp.104-118). The alternance of light and darkness determines time not as a series of points in a purely "extensive" succession, but according to an "intensive content", making its intervals similar or dissimilar elements, corresponding or opposites, friendly or hostile. "The path of the sun and the course of the seasons are not regulated by an immutable law; they are subject to demonic influences and accessible to magical powers" (Cassirer 1955, p.110). Even the gods are qualified in an essentially temporal way, through their mythical biographies from which their specific powers and limitations derive. As a result, the concept of numbers is not that of modern science applied to space and time such as quantitative dimensions but a manifestation of a being "that communicates the essence and strength to all that is subordinate to it" (Cassirer, 1955, p.143).

Thus, in mythical consciousness, "all thought and all sensory intuition and perception rest on an original foundation of feeling" (Cassirer, 1955, p.95). The division of everything in rigidly determined classes and groups, typical of totemic culture, has the same original foundation. This classification constitutes the ontological ground upon which ritual patterns, social groups, legal and moral customs and traditions are formed and crystallized (Cassirer, 1955, pp.86-87). Classification from magical, ritualistic or traditional origins is the ontological anchoring to a common and deeply sedimented feeling. In this form, classification is a "pre-

discursive" factor to social integration. Meanwhile, the opposite happens when classification is used as a tool of abstract formalization, turning objects and people into undifferentiated units congruent to algorithmic processes.

Cassirer's epistemology indicates the concept of relation as an *a priori* form through which our experience of the world is organized. The externality and independence of objects with respect to the relational activity of the subject is only apparent. This is due to the fact that "in the fleeting series of indifferent impressions the constant relations in which they recur must gradually assume an independent character by which they are differentiated from the perpetual flux of sensory contents" (Cassirer, 1955, p.31). Relation is also the basis of our intuition towards individual objects or living beings and the consequent formation of generic concepts, classes, types, etc. This idea is shared by most of the Sociology community when faced with the problem of intuitive knowledge. Here, the relation is liberated from the condition of *a priori* form as established by Cassirer's neo-Kantianism and is equated with social interaction. In Schutz (1973, p.14) there is no difference between communication and the construction of typology, because the latter is a selective process that has social relationships as its foundation:

> The typifying medium *par excellence* by which socially derived knowledge is transmitted is the vocabulary and the syntax of everyday language. The vernacular of everyday life is primarily a language of named things and events, and any name includes a typification and generalization referring to the relevance system prevailing in the linguistic in-group which found the named thing significant enough to provide a separate term for it.

Typologies are therefore the constructs in which the inter-subjective meaning and culture that governs social groups are somehow incorporated. The correspondence between symbols that refer to a multiplicity and symbols of communication is reaffirmed by Mead (1934, p.146): "Our symbols are all universal. You cannot say anything that is absolutely particular; anything you say that has any meaning at all is universal". By "universal", Mead (1934, p.185) means what belongs to our common experience. When you consume something, food for example, it is the fact that we take the food with the hand and into the mouth that distinguishes it from the action of eating and determines it as a separate object:

> If we took our food as dogs do by the very organs by which we masticate it, we should not have any ground for distinguishing the food as a physical thing from the actual consummation of the act, the consumption of the food. We should reach it and seize it with the teeth, and the very act of taking hold of it would be the act of eating it. But with the human animal the hand is interposed between the consummation and the getting of the object to the mouth. In that case we are manipulating a physical thing (Mead, 1934, p.184).

Food is determined as a physical object separated from us by the fact that we can manipulate it and thus constitutes a symbol of the relationship between man and the object of this manipulation. But this relationship is common to all people and therefore food becomes a symbol of a universal experience. Such symbols can allow communicative interaction, because they refer to relations experienced by most individuals (Mead, 1934, pp.184-185).

Classification as a pre-discursive foundation of social practices is also claimed and used by Bourdieu (1984, pp.466-484). He indicated "the schemes of the *habitus*" as "the primary forms of classification" which allow and regulate the interaction of actors and the world (Bourdieu, 1984, p.466). Such schemes are a reflection of the division of society into classes and are incorporated in the *habitus* through social experiences that constantly reflect this division. As noted by Lash (1994, pp.155-156), the *habitus* does not present the concept of action as understood by methodological individualism but in terms of incorporation of basic common practices: "The theory of action requires [...] a disembodied actor, minimizer of costs and maximizer of benefits". Instead, "*habitus* only exists when set in its own world" (Lash, 1994, p.156). In both Bourdieu and Cassirer, what emerges is the substantial and social characteristic of our pre-discursive tendency to classify. Whether it comes from Bourdieu's division of society into classes or Cassirer's mythical representation of the world, what remains is that intuitive classification is the basis of the worldview shared by a social group or community.

The Table 2 shows our theoretical proposal about the influence of epistemological concepts of calculation and classification on the integration of modern society.

When classification is combined with calculation to reduce human actions to compute units (case 1 of Table 2 or coordinates YES, YES), social interaction is substituted by technical connections between algorithmic steps with a consequent loss of reciprocity between actors. This is the social condition we called logical disaggregation and the systemic effect we called system disaggregation. However, when classification is not used to subdue ontological entities to a calculation (case 2 or coordinates YES, NO), it exerts a primordial role in our perception of the world and is the form in which ontological constructs of social groups are established. Finally, we have the systemic actions belonging to the third case in which calculation does not need classification since it is applied to dimensions that are already numerical such as space, time and economic value (case 3 or coordinates NO, YES). Here, calculation can be used as a tool to enable social interaction despite physical distance. Following Giddens' terminology, we called "system integration" the phenomenon referred to in case 3.

Table 2
Calculation and Classification as Coordinate Dimensions to Analyze Social Interaction.

| | | Calculation | |
		YES	NO
Classification	**YES**	**Case 1** *System disaggregation* (Algorithmic connection between individuals encapsulated in steps of a process = logical distanciation)	**Case 2** *Social integration* (Reciprocity of practices between co-present actors)
	NO	**Case 3** *System integration* (Reciprocity between actors or collectivities across extended time-space)	

In the next section we will discuss a fourth case with the coordinates (NO, NO) in Table 2. Here, the individual cannot use the integration tools of cases 2 and 3 and also escapes the system disaggregation of case 1. Moreover, the relationship between the phenomena of cases 1 and 4 will be analyzed. Finally, the relationship between cases 2 and 3 will be analyzed in section 6.

4. THE "DIAGONAL" OF DISAGGREGATION

Case 4 represented by coordinates (NO, NO) in Table 2 summarizes the condition of social segments that tend to escape or to be expelled from all social formations inspired by classification and calculation. Nevertheless, we are not referring to the phenomena of social marginality as a static or chronic condition. As we shall see shortly, in this type of exclusion individuals are frequently affected by the integration mechanisms of case 2 or by the disaggregation mechanism of case 1. We refer instead to a dynamic phenomenon, represented by the loss of all references schematized in cases 1, 2 and 3. To better understand the difference, we shall consider the European Union's research coordinated by Serge Paugam on the characteristics of poverty in the EU.

Paugam (2013) divides poverty into three "ideal types": "integrated, marginal and disabling". It is termed *integrated* when entire social groups are involved and are kept cohesive through communal and traditional relationships. In southern European countries for example, poverty often involves large sections of the population whose members have never incorporated the ideal principles of bureaucratic and legal rationality. They may at times know quite well how to explore the mechanisms of this type of rationality. "Cronyism" in particular, is one of the phenomena by which such distortion of modern legality occurs. According to Paugam (2013, p.88, 128-138), a patrimonial vision of the public office binds the reception of assistance (often monetary) to a system of exchange of favors where personal ties and communal membership are on a higher plane than that of the bureaucratic-legal relationship. It is therefore a kind of

poverty that is deeply intertwined with the persistence of pre-modern forms of integration. The fact that these social groups are resistant to the processes put in place by the bureaucratic-industrial society pushes them toward social marginality. However, they find in traditional relationships with a stable condition of identity and "ontological security". This type of poverty conveys a form of social integration that is represented by case 2 in our analytical scheme.

Referred to as *marginal* by Paugam (2013, p.90, 139-179), the second type of poverty is characteristic of northern Europe where the poor are seen as "social issues" and constitute small and strongly "stigmatized" groups. In this case, the classification of "poor" is instrumental in neutralizing the problem, making it somewhat "invisible". In an attempt to escape this stigmatizing classification, people try to hide physical or cultural characteristics belonging to this group. Nevertheless, those who are formally classified as "poor" are often the target of intervention on the part of public administration, putting them in a kind of endless quarantine. The lack of socio-cultural tools condemns the people receiving assistance to remain bound to the protection of social services and see their condition of heteronomy strengthened. Without the possibility of autonomous interaction with society, those same sources of financial aid are reduced to bureaucratic acts that strengthen and stabilize the distance between the poor and society through their encapsulation in classifications and formalized processes. Because of the loss of reciprocity, this type of poverty falls in the case 1 of our analytic scheme.

The last type of poverty, termed *disabling*, can be included in case 4 in Table 2. Here, the individual is affected by a progressive loss of social ties and financial security. It is the kind of poverty that is increasing considerably in our era, where people expelled from the productive sphere accumulate several disadvantages. Insufficient income frequently leads to a weakening of family ties and private networks of mutual assistance, often causing loss of housing and health security and inconsistent participation in all forms of institutionalized social life (Paugam, 2013, pp.90-92, 181-233). Thus,

disabling poverty is not a clearly defined state; it does not represent a stabilized marginalization at the end of a process but the process itself, which can later lead to a kind of crystallized and culturally classified marginality. It eludes both integration processes in cases 2 and 3 and system disaggregation found in case 1 in Table 2.

Scott Lash (1994, p.119) pointed out that the current process of disabling poverty is the result of consumption "specialization". The multiplication of consumption patterns triggers a constant quest for innovation in manufacturing. The result is not only a trend toward flexibility in the combination of production factors, but also an increase in research and information processing activity. The value aggregated to the final product by its design and planning has become much greater. Massive amounts of work dedicated to the mechanical transformation of materials have been replaced with the production of information and communication (I & C). Workers with rigidly identified tasks and jobs according to the patterns and hierarchies of the bureaucratic model are experiencing gradual obsolescence, slipping toward the formation of an 'underclass' employed in marginal production activities, or are simply excluded from the new labor market as unsuitable (Lash, 1994, pp.127-135).

The relationship between logical distanciation and disabling poverty is not limited to the current form of capital accumulation. Phenomena similar to disabling poverty as defined by Paugam are generally found in the main economic revolutions which were closely linked to logical distanciation, such as the two revolutions that Arrighi (1989, p.97) called "primaries": the Industrial Revolution and the Organizational Revolution. In the former, the capitalistic concentration of production means and their integration in standardized processes (Mantoux, 2006, pp.56-74; Kriedte et al., 1981; Marx, 1955) resulted in disabling poverty for large numbers of farmers and crafts people. Many lost their livelihoods or were inserted into production processes that turned some of them into misfits (Thompson, 1967; Pollard, 1963). In the latter—the Organizational Revolution based on Fordism and Taylorism—disabling poverty occurred through a substitution of a type of formalization with another: the figure of "skilled crafts workers" which was central to the factory system introduced by the Industrial Revolution no longer had its place in the Fordist model. What was once a three-tiered industrial workforce structure represented by a top stratum of owners, an intermediate stratum of skilled craft workers and a lower stratum of unskilled manual workers became a two-tiered structure consisting of an upper stratum of salaried managers and a lower one of semi-skilled operatives. Skilled crafts workers were driven out of the system for being disadvantaged compared to the staff trained for administrative tasks as well as peasants, women and children who offered abundant and cheap labor for semi-skilled jobs (Arrighi, 1989, pp.104-105).
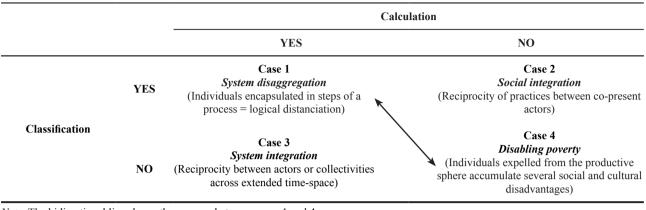
Such mass disabling mechanisms that occurred in the primary economic revolutions were repeated in different historical and geographical contexts of capitalist development. In Latin America for example, modernization processes have seen the ousting of workers from their 'pre-modern' activities. The result was massive migration toward cities, magnified by governmental plans for industrialization, as occurred under the military dictatorship in Brazil which saw the rural exodus of 28.5 million people between the 1960s and 1980s (Martine & Garcia 1987). Hence what literature calls the "sociopathic urbanization" of Latin America. The exodus of rural masses ousted from the lands by the advance of agribusiness could not be absorbed by the factory work in industrial parks, clearly undersized compared to the enormous demographic movement that occurred (CEPAL, 1979, pp. 81-101).

This phenomenon is viewed by "dependency theory" (Frank, 1966) as a specific feature of the bureaucratic-industrial model. Underdevelopment does not constitute an anomaly or a delay of some regions in laying the basis of modern civilization. It is a structural component of the world economic system, where the constitution of "peripheral" geographic areas is strategically functional to the mode of production and capital accumulation of the "core" area. In this scheme, economic and political institutions of peripheral countries replicate the same hierarchical and centralizing relationships to which they are subjected: New cores emerge in peripheral regions which subsequently transform their surrounding areas into their respective peripheries. Consequently, the development of these secondary cores has taken place through more underdevelopment and marginalization.

Whenever hierarchical classification qualifies a social group or geographical area, it automatically disqualifies another. It furthermore replicates the same process in these disqualified areas, creating a new frontier of exclusion with at its bottom the residue of socioeconomic marginalization. In conclusion, the bureaucratic-industrial civilization promotes socioeconomic mass disqualification. Using the categories shown in Table 2, it may be said that the phenomena of case 1 require the phenomena of case 4, establishing a synergy between the two cases. We will call this synergy "diagonal of disaggregation" (see Table 3).

Systems of time-space distanciation are currently promoting a social phenomenon that is not shown in Table 3: A synergy with communal culture that tends to favor integration processes. Thus, given the terms found in Table 3, we propose the hypothesis that in addition to the diagonal of disaggregation between cases 1 and 4, another diagonal of integration between cases 2 and 3 is emerging. To support this idea we will not only present theoretical analysis from the literature, but also results of empirical research in which we personally participated.

Table 3
The "Diagonal of Disaggregation"

		Calculation	
		YES	**NO**
Classification	**YES**	**Case 1** *System disaggregation* (Individuals encapsulated in steps of a process = logical distanciation)	**Case 2** *Social integration* (Reciprocity of practices between co-present actors)
	NO	**Case 3** *System integration* (Reciprocity between actors or collectivities across extended time-space)	**Case 4** *Disabling poverty* (Individuals expelled from the productive sphere accumulate several social and cultural disadvantages)

Note. The bidirectional line shows the synergy between cases 1 and 4.

5. THE 'DIAGONAL' OF INTEGRATION

Contradictions in the bureaucratic model revealed by organization theory and mentioned in section 3 have been perceived by large sectors of the business world since the economic crisis of 1973. The famous study by Porter (1985) on the factors of "competitive advantage" in the market reported amazing data about the tendency of companies to favor "horizontal" collaboration instead of the model based on the centralization of decision-making and mechanical execution of jobs. Dynamic collaboration through interdependent adjustments of activities was becoming the reference in profitability. "Partnership" was shown as an "aggregate value" (VAP) and crucial to obtain a good position on the market (Johnston & Lawrence, 1988). As stressed by Lambert and Peppard (2000, p.464), the real novelty was not the team work, which had already been experimented in the 1950s, but the fact that collaboration, which was once centered on the product, was now based on synchronizing activities of geographically dispersed groups, now possible thanks to information and telecommunication technologies.

In general, the principle of partnership has gone beyond the production sphere and now involves consumption. Online social interaction contributes in creating a culture that imposes its conditions on manufacturers' strategies. The idea that companies which fail to participate in online interaction are more at risk of losing markets (Qualman, 2009) is becoming prominent in the business administration literature. Empirical studies show that through online social networks, word-of-mouth prevails over advertising as the decisive factor in purchase decisions (Bughin et al., 2010). Exploiting this mechanism does not mean manipulating that form of communication to steer it toward pre-established objectives. Rather, it means turning the company's website into an independent social network, integrated

with the other internet communities, with the aim of shaping the company according to the discussions taking place in it (Owyang, 2010). Ideally, there would be no clear distinction between the enterprise and its social network. To quote a clever Brazilian researcher: "In a connected world [i.e. the web], a good business is a community with a purpose and not any set of patents, products and services[4]" (Meira, 2010).

However, the idea of online social networks as "communities" is debatable because they are *sui generis* social groups. The most reliable phenomena to demonstrate the synergy between systems of time-space distanciation and communities must therefore be sought in the relations between virtual and traditional communities. To this effect, Scott Lash (1994, pp.121-127) noted how Japanese entrepreneurial corporatism and communities that revolved around the German *Beruf* were particularly suited to developing an information-and communication-based (I & C) economy. For Lash, these two cases are emblematic of how communal environments favor the flow and the acquisition of information, "which are the structural conditions of reflexive production" that characterizes late modernity (Lash, 1994, p.127).

The main evidence supporting this synergy between communal and system integration is the possibility of social interaction now offered by the World Wide Web to the groups that have been marginalized by the dominant culture. They are now provided with a wealth of cultural diversity and represent an important aspect of the so-called phase of "flexible accumulation" of capital. In this form of development, world capitalism focuses not so much on the question of individual products - which is exposed to the danger of demand saturation - but on lifestyles, which are susceptible to countless variations and allow the renewal of entire lines of products (Harvey, 1990). Hence the economic importance of marginalized

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[4] Loosely translated from the original text in Portuguese.

social groups and the "visibility" that they are gaining in society: they may be a constant source of inspiration for the renewal of cultural patterns and markets (Yúdice, 2004).

To integrate with markets, a marginalized culture (or that was once marginalized) is forced to standardize the creation, production and marketing of its products, in a trend that leads to its own disintegration. However, cultural aspects such as behavior and lifestyle, which have always hindered the recognition of marginalized people as "citizens" now hinder their standardization (Yúdice, 2004). For example, Brazilian cultural and artistic expressions of the poorer communities such as funk and hip hop music create new ventures for fashion and markets and always retain elements of styles that are exotic to middle and upper class society. These types of music and dance become points of reference for entire generations of young people from all classes, despite being irreducibly transgressive and stigmatized by the ruling class for allegedly pushing the limits of violence and lawlessness (Herschmann, 2005).

Such music styles allow the young to communicate their concerns using musical styles and symbols from distant places such as the Afro-American or Hispanic suburbs of North America. These music styles and symbols are manipulated, re-interpreted through the culture of Brazilian poorer communities and relaunched in local music and fashion circuits for international consumption, making them available for further influence and hybridism:

> In fact, both funk and hip hop are types of popular and mass culture in a globalized world and are therefore assimilated and consumed by different social groups and segments [...] Individuals participating in these cultural events acquire a symbolic heritage, retracing the borders between traditional, modern, local and foreign culture. A constant contact between traditional symbolic systems is now established with international information networks and with the cultural industries in general.[5] (Herschmann, 2005, p.73)

Such contact between local and global culture is made possible thanks to systems of time-space distanciation, which not only allow the exchange of products and experiences between "artists" from different places, but above all facilitate a mutual resonance between geographically distant cultural trends. This prepares the ground for hybridism in music and dance, giving a new meaning to objects of consumption linked to images of new social models.

The strength of remote communication which involves marginal groups and frequently uses symbols of consumption does not come from the consumption symbols themselves. Instead, it comes from the fact that time-space distanciation systems allow these groups to communicate autonomously with society, whether or not the symbols used are those of consumption. A demonstration of this is that marginalized social groups are gaining autonomy and visibility, not only as new consumers but also as traditional producers, craftsmen and entrepreneurs. We will now present the results from an extensive research focusing on the production of a "material culture" in Brazil, resulting in unmistakable trends in the development of new and autonomous relations between marginalized groups and society as a whole.

Various field researches developed by the *Laboratório de Políticas Culturais e Ambientais no Brasil* (LaPCAB)[6] have found the existence of a common denominator that confirms the trends observed on a global level by the work of George Yúdice (2004): Popular artists and artisans are heading for direct interaction with the market. Below, we present two case studies of this trend: *Figureiros de Taubaté* and *Artesãos do Miriti de Abaetetuba*. Both were directly investigated as part of a LaPCAB project by the author of this article and will be presented in the next two subsections. The investigations were conducted according to the procedures of the ethnographic approach, using classical techniques such as direct observation of the contexts to be studied, along with interviews and document analysis. Both studies saw the direct participation of local academic institutions, whose collaboration was crucial in presenting an accurate social-historical background of the research subject and in providing a stand point that is consistent with local reality. For the *Figureiros* case, four interviews were recorded in November 2011 and three in July of 2012. As for the artisans of *Miriti*, four interviews were recorded in May of 2012, two in March 2013 and three in August of the same year.

5.1 The *Figureiros* of Taubaté

Taubaté is a city of approximately 270,000 inhabitants located in the region of the Paraiba Valley in the state of Sao Paulo, Brazil. The *Figureiros* are craftsmen who have preserved and developed a local tradition of producing dried and painted clay "figures" (statuettes). Initially, their production was not professional but rather intended to address domestic needs such as Christmas decorations in their houses. Their production took on a commercial

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[5] Loosely translated from the original text in Portuguese.

[6] The "Laboratório de Políticas Culturais e Ambientais no Brasil: gestão e Inovação" (LaPCAB) is funded by the "Coordenação de Aperfeiçoamento de Pessoal de Nível Superior" (CAPES), an organization of the Brazilian federal government under the Ministry of Education devoted to the funding and evaluation of academic education. LaPCAB coordinates projects involving seventeen states and their research institutions. Its research focus consists in socio-technical communities where it can observe the interaction between human and non-human agents - including abstract systems – that affect actions and projects of social actors. The laboratory has carried out research on 33 communities, equally distributed among the seventeen states, representing an average of two communities per state, consequently creating a network of 27 researchers from universities and other institutions.

nature when they started to offer a wider variety of figures. According to research carried out in the 1980s and 1990s (Lopes, 2006), the activity of the *Figureiros* emerged during the rural migration toward Taubaté in the first half of the 20th century and became institutionalized during local modernization and urban marginality processes. In 1993, the *Figureiros of Taubaté* created an association and obtained a headquarter facility from municipal institutions which they called *Casa do Figureiro*.

Despite the fact that the *Figureiros* share traditional aesthetic values in their activities, each product has characteristics specific to its author and is also signed by them. Such products are exclusively sold in the *Casa do Figureiro* in Taubaté. The Association made the strategic choice of not distributing its products to retail. Retailers, like any other customer, have to go to sales counters at *Casa do Figureiro* to buy in bulk for resale.

The Association of Figureiros realized that its survival is linked to its ability to differ from anonymous handicraft and standardized industrial products. The fact that each piece is unique and signed by their authors guarantees this differentiation at the highest level. However, this does not protect them from the danger of losing the distinctive characteristic of the Figureiros, which is the observance of tradition in their craftwork and aesthetics of their products. Tradition holds a difficult position: personalization of their products can push craftspeople to abandon the canons of tradition, particularly under the pressure of shopkeepers in search of something exclusive or different. Additionally, the regular repetition of traditional aesthetic clichés often leads artisans to consider the serial production of 'figures' through the use of molds, especially under the pressure of resellers and institutions:

> What we want here is to maintain the tradition. Sometimes people [apprentices and artisans] come here with different ideas and many have to give up because they don't want to follow the tradition. Our greatest strength is tradition [...] Even SEBRAE [*Serviço Brasileiro de Apoio às Micro and Pequenas Empresas*[7]] came here suggesting we should become a cooperative: You will earn a lot more money, you will have much more space and pieces to sell'. But this would mean to start a piece and hand it to another artisan without finishing it. Nobody wants this. I want to have the pleasure of beginning and finishing my job, like everyone else here. So we refused SEBRAE's suggestion and they were disappointed.[8] (Josiane Sampaio, President of the Association of *Figureiros* of Taubaté, interviewed by the author on November 25th, 2011)

As a principle, the *Figureiros* forgo the benefits that the division of labor and intermediary business would offer in terms of increased production and sales volume. This option is now possible because systems of time-space distanciation have transformed the socioeconomic environment into a "techno-scientific-informational" network (Santos, 1993). In particular, the World Wide Web allows marginalized people to come into direct contact and develop autonomous relations with people and markets.

5.2 The *Miriti* Artisans of Abaetetuba

Abaetetuba is a city of approximately 150,000 inhabitants in the Brazilian State of Pará and is the core of a region that encompasses the municipalities of Moju, Igarapé-Miri and Barcarena, with a total of over 350,000 inhabitants. The city is going through a period of accelerated economic growth, mainly in the trade and services areas. The *Associação dos Artesãos do Miriti de Abaetetuba*[9] (ASAMAB) is involved in this socioeconomic contingency and sees the emergence of markets that were unthinkable just a few years ago.

The Association's purpose is the production and sale of toys made with a specific part (*bucha*) from a type of palm tree called *Miriti*. To give its products a differential edge, the Association relies on geographic characterization: "The Amazon*Miriti*". Their marketplace is primarily represented by direct sales of toys in the hugely popular festival of *Círio* - known nationwide and held annually in Belém, the capital of Pará – and in "*Miriti* Fest", an event that takes place every year in Abaetetuba, dedicated to the exhibition and sale of products made with *Miriti* wood. This gives the craft of *Miriti* a seasonal nature and hence many ASAMAB craftsmen also carry out other activities.

At the time of the first interview (May 2012), the artisans who were more involved with the Association also used *Miriti* to produce different objects such as packing cases as well as objects made with other types of wood. For Mr. Desidério (president of the Association in May 2012) this alternative production is considered to be particularly special and is therefore the most sought after by retailers. Both Mr. Desidério and Mr. Josias (known as "Pirías") reported that some products allowed the use of a 'technical division of labor': "There is one here [in the lab] that cuts the Miriti, the women who work here paint the figures, while young apprentices smooth them" (Pirias). This same group of crafts people try to use the Web to expand their market: Pirías stated that a good portion of his clients come from contacts made through the Internet, "but what is missing is a marketing office".

Also in 2012, elections were held for ASAMAB's leadership body which acts as the core of its program helping artisans to establish autonomous relationships with the market, taking advantage of the means of remote interaction now offered by technology. However, two problems arise as a result of the social marginalization that affects the vast majority of ASAMAB's members: The first is the artisans' housing conditions, made of a few small rooms precariously maintained and furnished.

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[7] Brazilian service of aid to small businesses.
[8] Loosely translated from the original text in Portuguese.

[9] Association of Miriti Artisans of Abaetetuba.

They do not offer the possibility of organizing a workshop where handicrafts can be produced and exhibited. In most cases the craftspeople work in their kitchen at home and sell their products through the Association or on the street during the cultural events mentioned above. The second problem is their relative lack of education, making it difficult to acquire the skills needed to communicate online. At best, members remain subordinated to the Association which has the means of interacting on the Web and at worst, to resellers who generally make them invisible to consumers. In an interview of March 2013, the current president of the Association Mr Rivaíldo spoke about these two issues:

> Today we have a project for expansion, restructuring and standardization of the workshops [...] It would be a production and exhibition facility for buyers and tourists [...] But [...] if you do not renovate the facilities, how can we produce on a large scale? The people, the same customer always tells us: "Why don't you expand?" There are positive and negative points. One thing is to distribute on a large scale, that we [the Association] have the conditions to do, we have partners to do this, and another thing is that tourists come here. Are we prepared for this? No. So we believe that the priority is to renovate the facility starting with the workshop, because these guarantee our production [...] We have Internet access here [at the Association] and we have two website contracts [...] Our craftsmen have a hard time with the issue of culture, education level, and so on. With this in mind, we have two projects, one which has already started [...] directed toward the craftsmen' social problems […] We have already managed to provide some level of education here [middle school classes in the headquarters of the Association], where there will be restructuring to receive more craftsmen [...] Many of them are illiterate[10].

Overcoming cultural and physical barriers that exist between marginalized people and society is an inescapable objective emerging among these artisans, especially with regard to possible remote interactions with tourists, 'citizens' of inclusive society and the market in general. Various trends initiated by the association's previous president show tendencies to implement the schemes of bureaucratic logic, but these do not prevent the artisans' impulse toward autonomy from gradually becoming hegemonic.

What is happening among the artisans of *Miriti* represents a mixture of the traditional world, the bureaucratic-industrial model and "distributed capitalism" (Rifkin, 2009), which constitute the remote and immediate past and contemporary history of the west. It is the transformation of the socioeconomic environment into a "techno-scientific-informational" network (Santos, 1993) that allows the intersection of historically and culturally distant models. It allows marginalized social groups to get in touch with social contexts from which they are excluded or physically distant. This type of social integration is completely different from that offered in the past, when integration

meant conforming to the standard model of the 'citizen', the product of socio-economic systems unrelated to marginalize groups (Fernandes, 2008; Souza, 2003). Today, remote communication makes it possible to integrate the inclusive society ("citizenship" society) and then during traditions of excluded communities.

We can therefore speak of a synergy between system integration and the culture originating from traditional communities. We will represent this synergy with an additional diagonal in Table 4, connecting cases 2 and 3, which we will call "diagonal of integration".

Table 4
The Diagonals of Disaggregation and Integration

		Calculation	
		YES	**NO**
Classification	**YES**	**Case 1** *System disaggregation*	**Case 2** *Social integration*
	NO	**Case 3** *System integration*	**Case 4** *Disabling poverty*

Note. The line between case 1 and case 4 represents the "diagonal of disaggregation", while the line between case 3 and case 2 represents the "diagonal of integration".

To better express the current conflict in social interaction between the forces inherent to both diagonals, we report the testimony of Álvaro Tukano, chief of the Amazonian Tukanos tribe (*Alto Rio Negro*, Brazil) and the recognized leader of 23 Amazonian ethnic groups (over 52,000 Indians). In an interview with the author of this article, he points out that it is only through direct communication with the "outside world" that his people can be "independent" as their ancestors were. In his words, it is clear that remote interaction and bureaucratic logic act in opposite ways with respect to his community's need for autonomy. Even if the Brazilian government's bureaucratic apparatus provides the indigenous populations with computers, its procedural logic tends to automatically disqualify the community regarding their use and once again imposes hierarchical intermediaries, thereby renewing the fundamental condition of its exclusion:

> A few years after Lula [Brazil's ex-President] was elected, a program called Cultura Viva was launched by Minister Gilberto Gil to establish *pontos de cultura* [cultural areas] along the Rio Negro river. Fourteen of them were installed. We have solar panels, computers, but nobody came to show us how to use them and until now we don't even have antennas [to pick up the signal of the Internet]; so it's the same as having nothing at all. Thousands of such installations were planned nationwide but are all in the same situation and we do not communicate because of that. Now, the priests have it [internet access], the military has it, the filo-Indian NGOs [created to defend the interests of the indigenous community] have it but we do not. Because of that, our dependence is very great: we depend on intermediaries and stakeholders who are the same ones who hinder our communication. They feel as if they were the masters of the Indians, masters of our words, masters of our souls, which are not pleasant. Because we think differently, we want to enter into

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[10] Loosely translated from the original text in Portuguese.

direct contact [with the outside world] without intermediaries.[11] (Álvaro Tukano, part of the interview of 10 January 2013)[12].

CONCLUSION

For Cassirer, modern epistemology arises when the concept of function replaces the concept of substance as a guide to knowledge. He uses the term "function" in the mathematical sense and in his approach the content of knowledge is not based on the terms found in a relation but on the relation itself. This concept is the hallmark of the development of modern knowledge and remains the epistemological reference for both contemporary science and philosophy (Cassirer, 1953).

Nowadays, there is a general convergence which also involves biological theories like those of Maturana (1998) on the idea of equivalence between knowledge and action, between the way we understand the environment and the way we interact with it. Once this idea is accepted, it is inevitable to assume that Cassirer's thesis - defining ancient and modern theoretical thought on the epistemological categories of substance and function - should also be relevant to the practical field and to social sciences. To understand how this idea can bear fruit, we must consider the equivalence established by the theory of computation between formal procedures (algorithms) and "effective" numerical calculation. Any given algorithm can manipulate numerical or apparently non-numerical objects but it still performs an operation equal to a numerical function. This means that the logic of a mathematical function is not only activated when we work directly with numbers but also when an algorithm is applied to administrative or industrial tasks, whenever instructions from a manual are used to operate a technological device or when we are involved in the multiple forms of bureaucratic action.

In the practical sphere, Cassirer's dualism of substance vs. function is especially represented in the form of classification vs. calculation. However, modern culture has combined these epistemological categories in a contradictory manner: on the one hand we have classification, which is a tool of ontological experience that has become a technical means to reduce people to computable units; on the other, we have calculation developed exclusively for logical operations that is now applied to ontological terms such as human beings. The result is the bureaucratic organizational model, where each individual is encapsulated in the step of a process and connected to others by the meta-individual logic of an organizational machine and no longer coordinated by their communicative interaction. We call this condition logical

distanciation, and system disaggregation the consequent loss of reciprocity between actors.

However, when calculation is applied to numerical dimensions such as space, time and economic value, it allows the formation of social interaction systems across extended time-space such as "modern money", markets, accounting techniques as well as transportation, information and communication technologies. Following Giddens' terminology, we called "time-space distanciation" the effect of these systems on social interaction and 'system integration' their capacity to allow reciprocity between actors in this extended time-space social environment.

In Table 3, a scheme presents the effects that calculation and classification categories have on social interaction when: a) they are combined to generate an application of calculation on human beings; b) classification is used appropriately to order ontological references; c) calculation is applied to numerical dimensions such as space, time and economic value; d) both calculation and classification fail as references for social actors.

In Table 4, we called "diagonal of disaggregation" the synergy that used to exist between cases 1 and 4 and "diagonal of integration" the synergy that is nowadays emerging between cases 2 and 3. The diagonal of disaggregation (cases 1 & 4) appeared because in both cases individuals were subordinated to the algorithmic "machine", either as parts of its gear (case 1) or as its residue (case 4). Instead, a synergy between cases 2 and 3 is a consequence of computer-mediated communication (CMC) through which *sui generis* communities are constantly being built. Most importantly, through CMC marginalized traditional communities have the chance to become partners on markets and members of society in general, overcoming not only geographic distance but also social and physical barriers that were generated as a result of their social exclusion.

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[11] Loosely translated from the original text in Portuguese.
[12] Retrieved June 20, 2015from http://www.facebook.com/Lapcab#!/photo.php?v=133010590193970&set=vb.118227031672326&type=2&theater

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