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# Intangible Flow Theory

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# Intangible Flow Theory

## Abstract

The intangible flow theory explains that flows of economic material elements (such as physical goods; or cash) are consummated by human related intangible flows (such as work flows; service flows; information flows; or communicational flows) that cannot be precisely appraised at an actual or approximate value, and have properties precluding them from being classified as assets or capitals. Therefore, although mathematical/quantitative research methodologies are very relevant for science, they are insufficient to study economy and society.

Due to its prejudice against non mathematical/quantitative scientific reasoning, neo-classic economics could not be technologically prepared to reach the intangible flow dynamics of economic phenomena. Furthermore, the neo-classic solution to call people human assets or human capital, besides being ethically very questionable, offers performative non-scientific metaphors that intervene in the production of the reality they claim to represent; and sabotages the study of well delimited research questions by scientific approaches outside the realm of neo-classic economics.

## 1- Introduction

When one observes a highly trained economist having a conversation with a fellow human being, he might be tempted to ask the economist whether that dialogue is occurring between two human assets or capitals. The question would not be out of place, as these classifications are used to refer to people in prestigious economic publications (for instance: World Bank 2003; Ciccone and Peri 2006; Ditman et al 1973; Barro 2001; Becker 1962). One could suggest that the difficulty of some economists to see the difference between people and things might be reflected in the output of research they produce. The embeddedness critique has been put to neo-classic economists because, although they tend to ignore or undermine the importance of the social relations, economic action is embedded in structures of social relations, and therefore, social relations are necessary to understand the economic action (Granovetter 1985; Callon 1998). The intangible flow theory develops the embeddedness critique by addressing the dynamics of social relations in economy and society.

Let us first define intangible; flow; and intangible flow. The word intangible means not tangible. According to Merriam-Webster's dictionary, the term tangible can be defined as "*capable of being perceived especially by the sense of touch*", "*capable of being precisely identified or realized by the mind*" and "*capable of being appraised at an actual or approximate value*". Because it is one of the characteristics that distinguish goods from services, intangibility has been often studied in organizational studies. Rathmel (1966) and Shostack (1977) noted that there are very few products that are pure physical goods or pure services. Most products have tangible and intangible components. However, the degree of product intangibility could be classified according to a continuum. Similarly to Merriam-Webster, Bateson (1979) makes a

distinction between approaches to intangibility, identifying two types. i) Physical intangibility: a product is intangible if it is not palpable or cannot be touched. It is roughly the first definition on Merriam-Webster that comes from the Latin origin of the word. Nonetheless, Flipo (1988: 287) makes us note that *“immateriality must not be confused with imperceptibility. Music is the perfect example of a perceptible yet immaterial reality”*. Even if the element has no material body, it is possibly perceptible by one of the four other human senses. ii) Mental intangibility, where the product cannot be grasped mentally (roughly a synthesis of the second and third definitions of Merriam-Webster). We will use the concept of intangibility without necessarily relating it to the sense of touch, but to the faculty of being identified with precision, that is, capable of being precisely identified or realized by the mind and capable of being appraised at an actual or approximate value.<sup>1</sup>

Intangibility is not an exclusive characteristic of services. It can be used to describe other important economic elements such as information. Mathematicians and statisticians (such as Soofi 1994; or Cover and Thomas 2005) are aware that information is intangible and try to devise quantitative methods to study it. Soofi (1994: 1243) clearly states: *“the notions of information consist of a spectrum ranging from semantic to technical. In the semantic context, the term information is used in an intuitive sense. It does not refer to a well-defined numerical quantity that can be used for measuring the extent of uncertainty differentials due to changes in the states of nature. In the technical sense, information is referred to as a well-defined function that quantifies the extent of uncertainty differentials”*. Yet, here we attain the *paradox of quantifying intangibility*, which applies to information. The elements of previous intangibility for which scientists can find quantitative methods to attribute well defined quantities, and therefore, can be precisely appraised at an actual or approximated value have properties of

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<sup>1</sup>Just as the passenger who reaches the train station just a few seconds too late does not need to touch the train to know precisely that he has just missed it.

tangibility, whereas the other dimensions remain intangible. Moreover, the use of quantitative methods is not a sufficient condition to achieve tangibility, as those methods can be used to produce pure metaphysical speculation and imaginary projections of future scenarios that could not be reached with precision. Furthermore, scientists support their work on concepts that are themselves highly intangible. As noted by Hayek (1967) in his theory of complex phenomena, there is a distinction between pattern recognition and pattern prediction, and for scientists to recognize complex patterns they must make (intangible) conceptual predictions of those patterns.<sup>2</sup> As described by Soofi, semantics would be a macro set where the dimensions of information that cannot be described through a well defined mathematical function would be put. Hence, for the purpose of scientific knowledge, the use of mathematical analysis can only capture certain dimensions of information. A simple distinction between data, information, and knowledge might already bring many difficulties (Boisot and Canals 2004). The conceptual formulation that there is a symbolic interaction between members of society mediated by symbols and significations, where the meanings attributed evolve with processes of stimulus and response (Blumer 1962, 1969; Perinbanayagam 1985) would not be reachable merely through mathematical reasoning. Nevertheless, the failure of mathematical reasoning to capture them would not imply the non existence of symbols, meanings and significations. In an apparently simple nearby communication between two human beings, not only are semantic words and language exchanged but a full range of highly heterogeneous transactions such as body movements and gestures (see for instance Montepare et al 1999; Kendon 1984), facial expressions (see Ekman and Friesen 1975), postures (see Heller 1997), eye gaze (see Knapp and

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<sup>2</sup> As in Popper (1959; 2008), and in this paper, Hayek defends a fact based scientific work, where scientific predictions must be formulated with the possibility of refutation/falsifiability

Hall 1997; Richmond and McCroskey 2000) or paralinguistic sound of the voice (see Scherer 1979; Wigboldus et al. 1999) are communicated even without the need for words.

By flow we understand the movement of an element deriving from a source, which implies that an element that is not flowing should be considered as static. A human related intangible flow is therefore the movement of an element, deriving from a person or group of persons, that cannot be precisely identified or realized by the mind; and cannot be appraised at an actual or approximate value. This paper focuses on intangible flows that are also human related, thus of direct interest to the social sciences (such as work flows, service flows, communication flows, information flows, etc). Yet, the intangible flow concept could be embraced by the natural sciences because not all intangible flows are human related. For instance, flows of light or atoms could not be precisely perceived by the human senses, but scientists have figured ways of studying them.<sup>3</sup> As occurs with the human related intangible flows, the non human related intangible flows can be integrated in dynamic sets comprising both tangible and intangible flows. As in the example of Heraclitus's river passing by into which one can step only once, the flow of the river may contain both tangible and intangible components. Most importantly, the intangible flows referred in this theory have an instrumental property that makes them from the field of science: they can be verified, even if through an imprecise description. Intangible flows that cannot be demonstrated are from the domain of metaphysics, and thus not a subject of discussion in this theory. Two examples of intangible flows that can be demonstrated are service flows and information flows. As explained in more detail later, products (outputs) such as

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<sup>3</sup> For instance, modern physics and cosmology have been developed assuming that the speed of light was a constant value  $c$ , but a recent theory, the variable speed of light theory suggests that the velocity of light might be variable due several factors, which would imply the need to rewrite everything that previously assumed a constant speed of light  $c$  (see: Magueijo 2003).

services have properties that distinguish them from tangible physical goods, such as intangibility, heterogeneity, perishability, and inseparability between consumption and production (Zeithaml et al. 1985; Zeithaml et al. 2006; Hoffman and Bateson 2006). Information also has characteristics that distinguish it from material elements because several of its dimensions cannot be precisely appraised at an actual or approximate value. Therefore, intangible flows cannot be considered equivalent to flows of economic material elements such as physical good or cash. The intangible flow theory will further advance our comprehension of economic material flows by identifying that human related intangible flows are necessary for the consummation of economic material flows.

The paper is organized as follows: Section 2 introduces an case study where it is possible to observe how human related intangible flows can be associated with specific material flows; Section 3 explains why neo-classic economics that rejects non mathematical/quantitative scientific approaches could not be technologically prepared to reach and observe intangible flow dynamics by itself; Section 4 formalizes the intangible flow theory; Section 5 discusses the challenge of testing the theory while also briefly mentioning supporting empirical evidence of another paper; and Section 6 concludes the paper.

## **2- Initial Case Study**

The intangible flow theory is a grounded theory, developed through a collection of facts and formalized for subsequent testability of its predictions, an ultimate goal of the grounded theory method (Charmaz 2006). Let us observe a case study where facts could be gathered: a conversation between two human beings (A and B) that would be associated with an apparently simple economic activity: the selling of a restaurant's lunch for two. A dynamic interaction between intangible and tangible flows can be identified, which in the theory is called intangible flow dynamics. 1) The choice of the restaurant: imagine that A becomes interested about the



place after reading a positive review in his regional newspaper. Here an intangible element, moves from the newspaper to A's cognition, leading him to have an action that he would not have otherwise. 2) B will be convinced by A to attend that restaurant through an intangible telephonic conversation, otherwise she would not be aware of that restaurant's existence. 3) They arrive in the restaurant, and in comes another human being, C, the maid, smiling and delivering an intangible service; she will soon indicate the table and bring the menu. 4) When A and B study the menu, the intangible information moves from the menu to their cognition. The choice will be discussed and communicated to C. 5) The tangible food and drinks arrive through the intangible service of C and required also the intangible work produced by staff in the kitchen, those who produced and sold the items, the manager, etc. 6) The communication between A and B does not involve only semantic words and language, but also body movements, gestures, expressions, postures, eye gaze or paralinguistic sounds. Communicators are, at one and the same time, senders and receivers of messages (Hargie and Dickson 2004: 14). After the desert and coffee, it is time to ask C for the bill. 7) The intangible information regarding the bill to pay is printed on a tangible piece of paper. 8) A is always forgetting his wallet at home. B pays the bill with her bank card. The cash flow will be reported in both bank accounts.

In the case above, note that although the transaction was implemented through a bank card in (8), thus containing intangible elements, the respective cash flow has tangible characteristics, as B, the restaurant and the banks can precisely quantify the cash flow. Therefore, the cash flow can be considered a material flow. Note also that the intangible flow dynamics in (1)-(7) that lead to the occurrence of the material cash flow in (8). The non occurrence of some intangible flows would necessarily result in the non occurrence of the material cash flow: (1) the newspaper had not published the restaurant's reference; (2) B had not answered her phone; (3)

the restaurant was closed. A similar reasoning is applicable to the material flow of food and drinks in (5).

### **3-Why neo-classic economics could not be technologically prepared to reach and observe the intangible flows by itself**

A development towards exclusively legitimizing the reasoning obtained through mathematical/quantitative deduction in highly-ranked economic journals and departments has been noted (Sutter 2009; Hopwood 2008; Beed and Kane 1991; Leontieff 1982). Addressing the predominance of economic reasoning in the disciplines of finance and accounting, which could be enriched by other types/forms of knowledge, Hopwood (2008) complained that unfortunately, we live in an era where curiosity is not enough reason to research. This represents the prevalence of what Caliskan and Callon (2009) call the neo-classic (formalist) economists. This group of researchers defines economy by its object: the study of utility maximization under conditions of scarcity. A single concept of instrumental rationality is used to explain the behavior of persons and organizations in every context. The utility function leads to the idea of the homo economicus decision maker (see for instance Thaler 2000), an ultra-rational being, whose behavior would be described perfectly by a mathematical function capable of quantifying rational expectations about the (unknown) future without any form of bias.

Caliskan and Callon (2009, 2010) argue for the existence of an “*economization*” process where the attribute (adjective) economics is the result of the “*assembly and qualification of actions, devices and analytical/practical descriptions as ‘economic’ by social scientists and market actors.*” In such a context, neo-classic economics, substantive economics, and economic sociology and anthropology would have distinct “*processes of economization.*”<sup>4</sup> However, the

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<sup>4</sup> When mentioning substantive economics Caliskan and Callon (2009, 2010) refer to the substantivist position proposed by Karl Polanyi in *The Great Transformation* (1944) and its associations with anthropology and

parallel validation of different approaches to explain the economy could lead to quite a problematic interpretation, as it might obstruct the advancement of our knowledge of concrete empirical phenomena. Contrary to Kuhn (1996), who would see distinct research paradigms competing for the dominant status, by providing more robust explanations to economic questions than neo-classic economic researchers, Caliskan and Callon (2009, 2010) would see political spheres in which hypotheses are equivalently valid as long as they are portrayed in the adequate research venue. In this relative sense, the “economization” concept could be compared with that of “hypothesization” to explain empirical phenomena; that is, hypotheses are valid according to the research environment in which they are depicted, not their actual verification. Suppose three hypotheses: a) the Earth is flat and rests in the top of a cube, b) the Earth has a spherical shape, and c) the Earth has the form of a turtle. Depending upon the “geographization” process accepted by the peers of the research sub-field, all hypotheses would be valid. Still, an empirical investigation could eliminate two of them. Similarly, to understand the economy, there are clearly specified empirical questions that can be addressed with testable/ refutable hypotheses by scientists outside the realm of neo-classic economics, such as the causes for growth, inflation, profits, financial decisions, economic crises, interest rates, etc. This is quite relevant because as Keynes (1936: 383) put it, *“the ideas of economists and political philosophers, both when they are right and they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist”*. The questions should not be confused with the answers. The same specific research questions

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political economy. Nonetheless, the reasoning in Caliskan and Callon would be applicable to other heterodox economic frameworks that do not completely accept the neo-classic propositions such as Post-Keynesianism, Feminist Economics, Evolutionary Economics, Marxist Economics, Institutional Economics, Post Autist Economics and others (see Lee, 2009 or Lawson, 2006)

can be studied by distinct groups of researchers. To accept the economy of thought of validating different “economization processes” that provide contradictory hypotheses, as long as they are launched in the proper peer group regardless of the verification of the hypotheses, would avoid the difficult but necessary challenge of identifying which approach could better explain the empirical phenomena that we observe in society.

A second point is related with the research methods available in each discipline to explain the same empirical phenomena. If neo-classic economics can only use mathematical/quantitative tools of reasoning to posit its hypotheses, then it cannot be technologically prepared to reach intangible elements that cannot be precisely identified or realized by the mind; and cannot be appraised at an actual or approximate value. This severe limitation of neo-classic economics is not necessarily a form of “economization,” but a deficiency of the research methods accepted in its research paradigm. Flows of tangible (material) elements such as physical goods or money, can be precisely quantified and thus observed by the research tools of neo-classic economics. However, as suggested by the intangible flow theory, the dynamics of the tangible elements require several human related flows that do not share the same properties of the easily quantifiable material elements that they are moving in economic action. Hence, social science disciplines such as heterodox economics, sociology and anthropology, but also organization studies, accounting, or history have an advantage in explaining concrete economic phenomena over neo-classic economics, because besides accepting advanced statistical and econometric methods of inquiry, they are open to other forms of reasoning to reach testable hypotheses that could capture the intangible flow dynamics in society. Natural sciences can also be of great help in contributing with methodologies to enhance the study of intangible flow dynamics, but cannot be considered the exclusive source of scientific methodologies. Otherwise, neo-classic economics does not accept hypotheses that are not founded on concrete mathematical reasoning, and as Leontief (1982: 104-7) noted, it can avoid the “*outset to the harsh discipline of systematic*

*fact finding*” that is common in other scientific fields. Hopwood (2008: 91), identifies worrying signs that he classifies as *crude intellectual prejudice: while (neo-classic) economics as a subject has tended to invest heavily in the intellectual policing of its own boundaries, over the years ridding itself of its institutional, historical, political economy and other variants, this need not necessarily imply an intolerance of completely different disciplines. But that has often been the case*”.

Nonetheless, the exclusive reliance on mathematical/quantitative research methods has deep consequences. It makes neo-classic economics technologically improperly equipped to study economy and society. The major problem is not the mathematical/quantitative methods, as those are relevant instruments at the disposal of scientists. It is an idealization of these methods leading to a theological belief that the mathematical/ quantitative tools should primarily eliminate any other form of scientific inquiry. Mathematical/quantitative deduction, as it requires quantification, could not be technologically prepared to observe that, as in the case study above, the flow of many elements that cannot be quantified with precision, and have properties precluding them to be considered either assets or capitals, are necessary for the occurrence of the material flows. With deep respect for mathematics and aiming to expose its abusive utilization, we call the neo-classic belief as the metaphysics of mathematics. That is, neo-classic economics does not possess research tools necessary to understand concepts formulated without mathematical/ quantitative reasoning or even to understand the pernicious concepts it is obtaining with its theological belief. Hence, the intangible flow theory, formalized in the next section, can be employed as a response to the metaphysics of mathematics in social sciences (and possibly the natural sciences).

#### 4- Enter the Intangible Flow Theory

Developed in this section, the initial formulation of the theory appeared in an approved thesis (Cardao-Pito 2004). The first step to reach the conceptual framework is through the tangibility of concrete material elements. Physical goods, such as cars or clothes are tangible elements quantifiable with precision. The same applies to long-term fixed investments such as property, equipment, and plant. However, what about money, which can take several forms, such as notes and coins, cheques, credit cards, or online accounts? The intangible flow theory will define that cash flows, i.e., flows of money and its equivalents (Merriam Webster), are tangible because they can be precisely quantified at an exact value. The material practice of money is one of its defining properties, even if related to distinct symbolic referents and social systems (Gilbert 2005). That is, although money can have several social roles and meanings, under discussion by social scientists, it also has a pragmatic nature in modalities of exchange and circulation (Maurer 2006).<sup>5</sup> Whichever form a cash flow may assume, human beings are able to know the exact amount of money that has been moved. In the same manner, through the cash flow statement, a corporation presents a precise report of its complete cash movements during each fiscal period.

Therefore, through their research tools that require mathematical/quantitative modeling, the neo-classic economists can observe the cash flows, and they can also quantify several empirical variables that are materialized in monetary values, such as inflation, profits, growth, capital structures, interest rates, financial deficits, etc. When neoclassic economists call people

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<sup>5</sup> As put by Maurer (2006: 30);: “*representational flaw does not mean representational failure, either for money or for anthropological (and other social science) accounts of it*” or, as put by Callon and Muniesa (2005: 1245): “*Economic calculation is not an anthropological fiction, precisely because it is not a purely human mechanical and mental competence; it is distributed among human actors and material devices.*”

and their contributions human capital or human assets they are presupposing that people and their contributions can be owned, manipulated, and accumulated as physical goods or cash. The denomination of humans as assets or capital could be compared with a performative function, described in Mackenzie (2007), as instead of representing an external reality, such comparison directly intervenes in the reality it claims to represent. People would be assets or capital because neo-classic economists call them this, not because there is any empirical evidence that we behave like property, equipment, merchandizing, loans or stock market shares in society. Besides the serious ethical issues in placing people at the same level as material things, the neo-classic economic framework is profoundly flawed, as it fails to understand the complexity of people and their intangible activities. Let us further study two types of intangible elements that have different properties to tangible (material) elements, namely, services and information.

Organizational literature revealed that products can be classified according to their level of intangibility. The scale suggested by Schostack (1977) ranges from most tangible (such as clothes and furniture) to most intangible (pure services such as consulting or teaching). In the middle of the scale are the products combining tangible and intangible components. For example, meals in restaurant chains mix tangible food and drinks with intangible services and marketing. Several academic textbooks on the marketing of services (as Zeithaml et al. 2006; Hoffman and Bateson 2006; McColl-Kennedy 2003) adapt a definition of services that could be traced back to Rathmel (1966: 33). Services are “acts, deeds, performances, or efforts,” and physical goods are “articles, devices, materials, objects, or things.” As noted by Rathmel (1966), there are very few products that are purely services or purely physical goods. The most tangible of goods requires services to be sold/delivered to customers, and the most intangible of services are generally associated with elements of tangibility (for example: the receipt).

In their survey of a significant set of research in organization studies, Zeithaml et al. (1985) identified four characteristics that distinguish services from physical goods: intangibility, heterogeneity, inseparability of production and consumption, and perishability. The property of perishability suggests that services cannot be saved, stored, resold, or returned as physical goods. Lovelock and Gummesson (2004), who tried to replace the framework in Zeithaml et al. (1985), recognize that the system of Zeithaml et al. is the most widely acknowledged and amply taught in academic textbooks. Lovelock and Gummesson suggested another characteristic that would distinguish services from the physical goods: the non-ownership of the services: although the customer has the right to consume the service through a rental or access fee, he cannot own the service as he would be able to own a physical good. Nonetheless, the non-ownership of services seems to derive from the same properties identified by Zeithaml et al. (1985), and, particularly, the intangibility from where the other key goods-services distinctions may emerge (Bateson 1979; Zeithaml et al. 1985). Intangible, heterogeneous, and perishable products such as services, normally consumed when produced, are not reported on the balance sheet as assets (or capital), unlike physical goods or other assets (or capital) such as cash.

Stiglitz (2000), an author on the theme, claims that neo-classic economic studies about information have made a rupture with the past. Currently, it would be amply accepted that information is imperfect, that there are costs to obtain information, and information asymmetries, which are affected by individuals and organizational actions. Accordingly, the traditional knowledge from the neo-classical characterization of the market economy would be deeply affected by such findings. Following a neo-classic framework, some studies describe information or knowledge as *public goods* (as World Bank 2003; Stiglitz 1999 2007), comprising two main distinctive properties (Stiglitz 1999: 309): i) Nonrivalrousness: there is zero marginal cost from an additional individual enjoying the benefits of the knowledge (or information) and ii) and non-excludability, which implies that no one can be excluded from the



respective use, that is, if information and knowledge are not defended with copyright, licenses, or confidentiality, then they cannot be easily protected, unlike, for example, a machine brought and registered in the name of a corporation. Still, the neo-classic understanding about information might yet be very poor. Because it ignores the intangibility of information, neo-classic economics could not notice that intangibility distinguishes information from physical goods. Furthermore, information may not verify the same conditions of scarcity observed in other resources. The oil or gold reserves of our planet are limited, whereas a good idea can be downloaded on the internet as many times as possible. In order to apply its pareto optimality via utility functions, neo-classic economics needs to assume that scarcity is the natural condition of any resource. Thus, it misses the socio-cultural element of the analysis because scarcity could be inherent to the human use of that resource (Daoud 2010). Moreover, resources do not always need to be scarce. They can also be sufficient or abundant, as it occurs with information, and poses series difficulties to the neo-classic analytical framework based on assuming the scarcity of all resources (see Daoud 2010 or Lee and Keen 2004).

As described by Voler et al. (2009) neo-classic economics sees information as signals, which separates information from cognition and makes a distinction between meaningful signals and noise, with the latter being understood as a lack of determined patterns. The movement of information would be similar to that of signals circulating on a circuit board. Yet, the logic of neo-classic economics, that information, knowledge, and relations would be assets implies that those so-called assets are inside the brains of human beings. Hence, they can not be separated from the respective human cognition and affectivity. What is worse, for millenniums in philosophy, an unsolved debate of what is in fact knowledge (and information) has subsisted. However, taking a shortcut, neo-classic economics already makes monetary valuations of knowledge and information without knowing what and where they are. One could suggest that first it would be necessary to understand it. The work with knowledge and information is not

static. It is dynamic, as it is the work with relationships and of what are called social assets. A relationship must be dynamized to exist.

The utility functions can be used to solve problems where resources are really scarce and precisely quantifiable. For instance, a firm can use an utility function to decide what proportion of physical goods  $x$  and  $y$  should buy given its limited budget. However, as described by a neo-Schumpeterian theory of the firm (see Winter 2006; Levintahl 2006), just as the fragmentation of knowledge in the firm makes innovation difficult and the consequences of attempted innovation unpredictable, it tends to frustrate the economist who wants to predict the lines that knowledge innovation will take. Innovation management researchers recognize that the uncertainty with regard to the value-creating potential of product innovations increases with their technological novelty, and have argued that the usefulness and value of novel products are socially constructed (Rindova and Petkova 2007). Innovation is both a process and an outcome (Crossan and Apaydin 2010). As noted by Winter (2006: 138) General Motors has a certain knowledge about producing automobiles that may or may not be applicable for the problem of producing corn flakes. Nevertheless, neo-classic economics acts as if it could quantify every dimension of information and knowledge, in order to develop its mathematical reasoning. Through utility functions, neo-classic economics previously assumes homogenization of human reactions and decisions related with information. A simple mathematical “utility” function and its two derivatives would describe the decision process of the entire mankind. Hence, it fails to address a simple aspect as two persons can differently interpret the exact same information. The neo-classic practice of treating information as mere parameters in the utility functions is in direct contradiction with the facts that i) mathematical/quantitative reasoning is not technological able to reach the semantic dimensions of information and ii) human use of information and knowledge is not separable from the respective human cognition and affectivity. The mathematical homogenization of human cognition and affectivity professed by neo-classic

economics is an unscientific belief that can be refuted through cognitive distortions of human perception that influence human beings rather heterogeneously, and can vary even with the same person, according to the information received or communicated. In those distortions, one could include the halo effect that refers to drawing a general impression about an individual on the basis of a single characteristics, as the appearance or status (see more in Naquin and Tynan 2003); the contrast effect, where the appraisal of information would be considered differently if not compared to other information (see Plous 1993); the Freudian projection effect, which refers to attributing characteristics or emotions of the self to other people or information (see Wade 2000) or the stereotyping effect (see Hilton and Hippel 1996). It is not a matter of finding psychological or sociological based parameters to include in the computation of utility functions and Pareto equilibriums, as done in what is often called behavioral economics, and represents a mere development of the neo-classical framework, as clearly stated in the literature reviews as Camerer and Loewenstein (2004) or Rabin (1998). Such approach would fail to capture basic intangible instances of human cognition, social relations, symbols, meanings and significations. To advance our scientific knowledge of economy and society we must break free from the metaphysics of mathematics that neo-classic economics would want to impose upon social sciences.

The Intangible Flow Theory will proceed as follows: First, one defines cash flows as tangible flows because they represent concrete monetary transactions that are clearly identifiable and quantifiable. Second, one posits that the information (and knowledge), physical goods, and capital should be considered static in the generation of cash flows if they are not dynamized by intangible flows that are mainly human-related and cannot be precisely appraised at an actual or approximate value. Although human beings are not intangible, some of their contributions can be intangible (such as work flows, service flows, information flows, knowledge flows, communicational flows, etc.).

Hence, we can now reach the fundamental proposition: *In Society, the occurrence of economic material flows, as the flows of physical goods or cash, is associated with intangible flows inherent to human actions that are necessary to the prosecution of those material flows. The cash flows cannot be considered intangible flows because even when they have an intangible form, they have properties of tangibility, as they are precisely quantifiable at an actual or approximate value. Thus, the analyses and decisions related to economic material flows must consider the more relevant intangible flows that are necessary for the material flow consummation.*

According to the theory, the intangible flows with effects on the cash flows can be of various types, such as service flows, relationship flows, communication flows, information flows, knowledge flows, data flows, etc. Although they could not be precisely quantified, they are necessary for the occurrence of economic material cash flows. The intangible flows require an abstract formulation specifically because of their inherent intangibility. Therefore, an abstraction is a necessary description for their study and understanding. Nevertheless, this theoretical formulation can be corroborated by empirical tests that prove the association of intangible flows with concrete cash flows.

In the developing of and with reference to this theory, these subsequent corollaries should be considered: *First corollary: associated with the occurrence of the economic material flows, there can be a very vast and complex conjunct of intangible flows, in which, inclusively, some of those intangible flows can be very difficult to identify.* This first development appears to explain that this is not a motive for the concept of intangible flows not to be recognized or scientifically systematized, nor is it a motive for the concept of intangible flows not to be considered. What is complex and what is simple depends on our knowledge and understanding, and changes over time. Scientists may device precise methods to capture currently intangible dimensions.

However, intangible will remain the existing dimensions that scientists would not be capable to precisely identify, realize or appraise at an actual or approximate value.

*Second corollary: It is not necessary for a temporal coincidence to exist between intangible flows and economic material flows for intangible flows to impact material flows* (for example: the training of the personnel may take some time to have effects on the productivity of the organization, or the marketing campaigns might take some time to have intangible consequences that will be reflected in the organization's money in-flows). Inclusive cash flows, as they are part of a dynamic process, might have effects on intangible flows and the latter again will have influence on other cash flows of the organization (for instance: the expenses with publicity or branded merchandizing collocated near the potential clients, etc.).

*Third corollary: The non-occurrence of economic material flows can also be a consequence of intangible flows that have a negative effect on their consummation* (such as advertising campaign from a competitor, poor quality services, cost reduction policy, etc.). Similarly, intangible flows exist that might worsen the cash flows of an interested person or group (for example: staff absenteeism, political effects, etc.).

*Fourth corollary: the materiality of cash flows refers to cash flows that occur within a precise interval of time. Not yet verified cash flows cannot be considered already materialized.* This corollary establishes a difference between those cash flows that can be precisely quantified, for they have factually taken place, from those that despite an appearance of measurability might not be precisely quantifiable because their occurrence is uncertain. For instance, when neo-classic economics requires projections of future cash flows to operate their concepts of “discounted future cash flows value” or “utility maximization under pareto optimality”, the non verified cash flows cannot be considered already materialized and thus their quantification might be object of speculation and/or imagination. For instance, neo-classic economists claim to

have done a mathematical synthesis of Keynes's thinking, but Keynes himself (1936: 149) was aware that our knowledge of factors that will govern the yield of an investment some years hence is usually very slight and often negligible.<sup>6</sup> The neo-classic futurology can bring much harm to society and social science because it may assure an appearance of certainty to rather unknown economic outcomes.

*Fifth corollary: Although mathematical/quantitative research tools can be used to precisely measure economic material flows, they are insufficient to research and capture intangible flows and their relationships with the material flows.* This corollary explains why 1) although mathematical/quantitative methods are very relevant for science, they are insufficient for studying and understanding the intangible flow dynamics of concrete empirical phenomena observed in economy and society; 2) because it professes a metaphysics of mathematics that refuses to accept non mathematical/quantitative forms of scientific inquiry neo-classic economists simply cannot reach complex human-related intangible flows that are necessary for the consummation of precisely quantifiable economic material flows.

## **5- The challenge of testing the theory**

As currently formalized, the grounded intangible flow theory is stated for subsequent testability. Therefore, the challenge is to identify intangible flows and establish concrete associations with economic material flows, as done on the case study above. Figure 1 exemplifies the complexity of several intangible flows with influence in the cash flows of an

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<sup>6</sup> Keynes (1936: 149): *“If we speak frankly, we have to admit that our basis of knowledge for estimating the yield ten years hence of a railway, a copper mine, a textile factory, the goodwill of a patente medicine, an Atlantic liner, a building in the City of London amounts to little and sometimes to nothing; or even five years hence. In fact, those who seriously attempt to make any such estimate are often so much in the minority that their behaviour does not govern the market”*

organization. It represents a simplified visual model with a dynamic network of intangible flows that could be used later for testing the intangible flow effects on a organization's cash flows. The figure's purpose is to express evidence of the intangible flows, not to represent the complete set of relevant intangible flows.

**(Figure 1 here)**

Mentioned briefly here, Cardao-Pito (2010) presents empirical evidence supporting the Intangible Flow Theory. Cardao-Pito (2010) devised a method, called “Level of Operating Intangibility” to classify firms according to the materiality of the flows of products (outputs) sold to customers. Physical good-intensive (as Ford and Shell) and intangible product-intensive firms (as Microsoft and Lastminute.com) appear on both ends of the scaling system. Firms that offer a mix of physical goods and intangible products, or firms offering products that are themselves mixed, lie somewhere in the middle (as Coca-Cola and Pepsi Cola that sell much intangible marketing and advertising in each bottle of their drinks). The classification was implemented on a very large sample involving 107,070 observations of 10,281 US firms over a period of 41 years (1966-2006) and confirmed by many econometrical tests. Cardao-Pito (2010) shows that the materiality of product flows is strongly correlated with several firm characteristics, which are dear to economics. Concretely, a higher Level of Operating Intangibility was associated with five expected properties of intangible-product-intensive firms: i) smaller size, ii) lower capital expenditures in property, equipment and plant, iii) lower profitability, iv) higher stock market valuation of equity (market-to-book), and v) less debt in the capital structure (leverage). As the transactions of products are eminently social processes, Cardao-Pito’s paper provides a strong argument for using scientific approaches outside the realm of neo-classic economics to study economic phenomena.

## **6- Conclusion**

The idea that the Earth has spherical shape is not compatible with the idea that the Earth is flat and rests on top of a cube, regardless of what Caliskan and Callon (2009) call actions, devices, and analytical/practical descriptions that could be used to argue any of those possibilities. Several concrete empirical phenomena of society, traditionally studied by neo-classic economists, can be addressed by alternative explanations, such as the causes for growth, profits, inflation, financial decisions, financial crisis, etc. Scientists outside the realm of neo-classic economics should accept the challenge of attempting what Kuhn (1996) defines as paradigm changes in explaining those phenomena, even if this means entering into direct confrontation with the neo-classic explanations derived from its metaphysics of mathematics. As in Socrates's ancient lesson, the obstacle is not an ignorance aware of its fragility, but the self sufficiency of an apparent knowledge.

Developing the embeddedness critique (Granovetter 1985; Callon 1998) the intangible flow theory, and particularly its fifth corollary, demonstrates that, currently, neo-classic economics is not properly equipped to provide explanations for empirical phenomena observed in economy and society. Because neo-classic economics only accepts mathematical/quantitative forms of reasoning to explain human and social activities, it simply does not have the necessary research instruments to cope with society's complex intangible human flows that cannot be precisely identified or realized by the mind; cannot be appraised at an actual or approximate value; have properties excluding them to be considered assets or capitals. Therefore, besides exhibiting prejudice against other social sciences (Hopwood 2008), neo-classic economics, is not technologically prepared to understand the intangible flow dynamics of empirical phenomena. It has further consequences the exclusive acceptance of mathematical/quantitative tools as method of inquiry, not least an obsession for measurability. As explained by the fourth corollary, often neo-classic economics confuses occurred cash flows that can be precisely



quantifiable with predictions of future cash flows that only apparently can be precisely measured. For instance, projected, speculative or imaginary cash flows are necessary to compute utility functions to calculate pareto optimality and discounted future cash flow models. As explained by the first, second and third corollaries, the economic material flows are consummated or annulled by intangible flows that can be highly complex and temporally non coincident with the putative economic material flows. Similarly, to restrict human beings to assets or capitals would fit the need for quantification through mathematical models. People would become computational parameters. No need for other forms of scientific inquiry would be felt. However, such a performative logic must be exposed. Serious ethical issues exist in calling people as assets or capitals, as this would redirect us to odd discussions about ownership over human beings and the monetary value of a person. These flawed comparisons profoundly sabotage the understanding of intangible flow dynamics in society. People would be assets or capitals not because of any scientific evidence of the statement, but because neo-classic economists previously defined us as such.

The explanations of empirical phenomena might benefit from knowledge obtained from quite distinct fields such as heterodox economics, sociology, anthropology, organization studies, accounting, history, philosophy, etc., or interdisciplinary studies among them. We should not argue for the substitution of a tyranny of explanations for others, as this would be repeating the intolerance of neo-classic economics to other forms of reasoning. Moreover, although mathematical / quantitative tools are insufficient to describe and understand intangible flows, it does not mean that the mathematical and quantitative tools should be disdained. On the contrary, those methods are quite relevant for empirical analysis of hypotheses and samples, and the natural sciences can give very precious help in providing methods for quantifying several dimensions of current intangibility and in exposing the metaphysics of mathematics as professed

by neo-classic economists. Scientific work bases itself on highly intangible concepts, and the concept of natural intangible flow may also be of use for the natural sciences.

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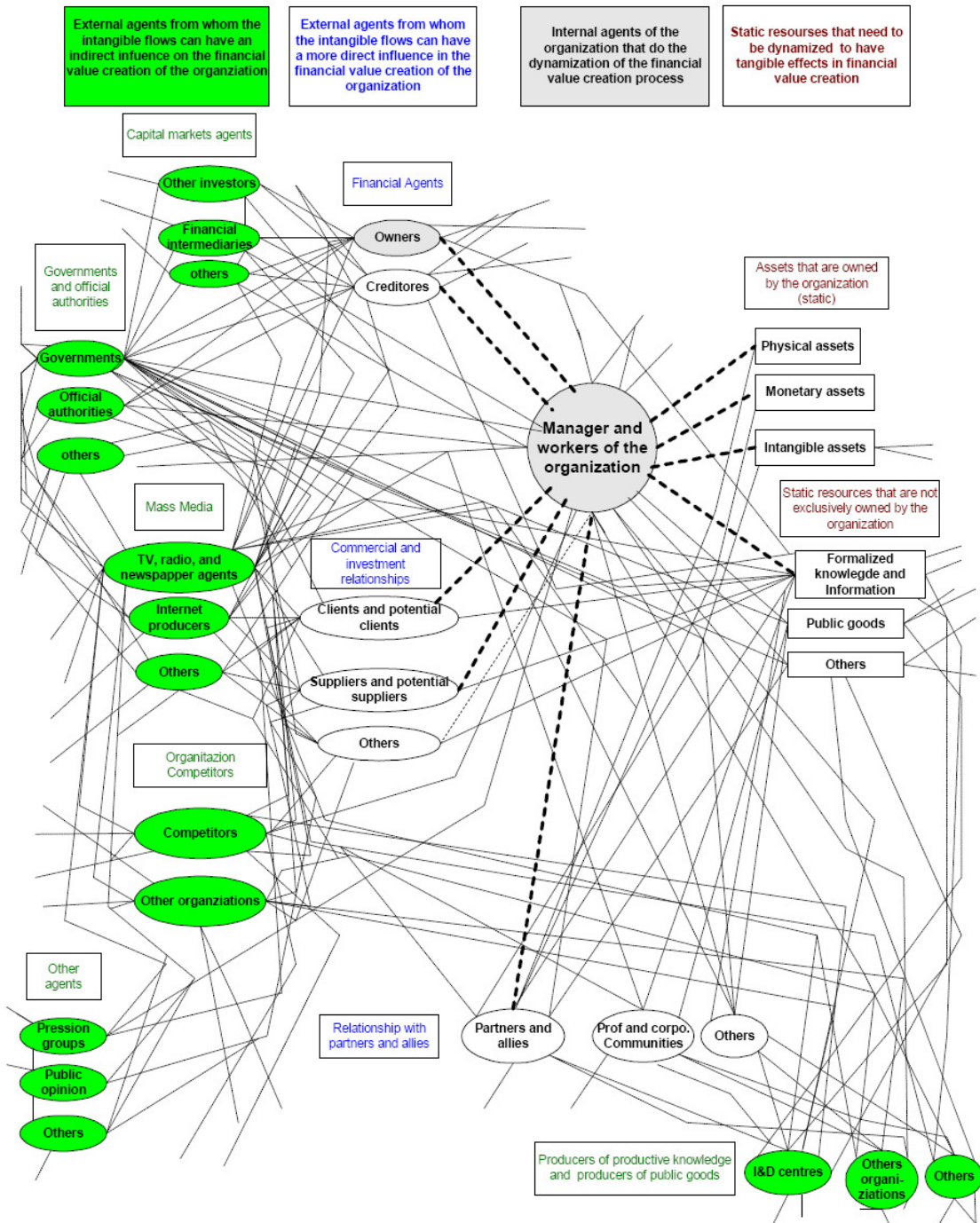
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**Figure 1 – Exemplification of intangible flow dynamics with implications on an organization’s material cash flows**



Source: the Author