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Reflections on the criteria for the sound measurement of intellectual capital: A knowledge-based perspective

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ABSTRACT

As knowledge has become a key factor of competitive advantage for organizations, regions, and nations, its measurement has gained tremendous importance. During the last two decades, the intellectual capital school of thought has produced numerous measurement frameworks and models for capturing the intangible bases of value creation, which currently occupy a well-established position in academia. In this paper, we argue that something important might have been lost along the way, namely, a thorough understanding of knowledge as the basis for human and organizational productive behavior. We argue that in order to remain relevant in the face of the increasing knowledge intensity of work, organizing, and value creation, the measurements of intellectual capital (IC) should revisit the foundations of what knowledge is. In order to regain this understanding, this paper draws on a knowledge-based perspective and proposes four critical themes that should be better recognized in IC measurement: multi-dimensionality, human agency and action, contextuality, and temporality and dynamics. We discuss the challenges that each theme poses for IC measurement and construct a set of criteria and applications for a more adequate measurement of IC.

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1. Introduction

It is widely accepted that knowledge and competencies are the key factors of production, and that continuous learning, development, and renewal have become the main organizational capabilities that drive competitiveness (Drucker, 1988; Grant, 1996; Kogut & Zander, 1992; Prahalad & Hamel, 1990; Teece, Pisano, & Shuen, 1997). Thus, organizations are becoming more interested in assessing, managing, and developing their intellectual assets. This challenge to both academics and practitioners has led to the emergence of the intellectual capital (IC) approach (Bontis, 1999; Edvinsson & Malone, 1997; Mouritsen & Roslender, 2009; Petty & Guthrie, 2000; Roos & Roos, 1997). In an extensive review of IC literature spanning a decade, Guthrie, Ricceri, and Dumay (2012, p. 68) define IC accounting (ICA) as “an accounting, reporting and management technology of relevance to organisations to understand and manage knowledge resources.” Specifically, this approach attempts to overcome the limitations of conventional financial indicators that are used to explain, measure, and manage organizational performance and to provide classifications and metrics for intangibles that examine value creation from a more comprehensive perspective.

Along with the more general “practice turn” in business disciplines (Corradi, Gheradi, & Verzelloni, 2010; Feldman & Orlikowski, 2011; Jarzabkowski, 2004; Whittington, 1996), shifting the focus from objectified social structures and systems

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to arrays of human activity (Schatzki, 2005), ICA scholars have increasingly turned to the lack of a practical implementation of IC indicators (Demartini & Paoloni, 2013; Dumay, 2012; Dumay & Garanina, 2013; Mouritsen, 2006). Although academics have proposed several measurement frameworks and models for IC, practitioners have not been very keen on adopting them, and only a few organizations have jumped on the bandwagon of measuring IC (e.g., Dumay, 2016; Kujansivu, 2008; Lönnqvist, Sillanpää, & Carlucci, 2009).

As Dumay (2016, p. 172) argues, although “IC wealth-creation is running out of steam from a reporting perspective, this does not mean managers are not realizing the benefits of managing their IC internally.” Thus, the problem does not seem to lie so much in managerial ignorance about the importance of IC but in the lack of tools that they deem suitable, useful, and executable. For example, in a pioneering study addressing the reasons for the lack of implementation of IC management, Kujansivu (2008) reports that managers in Finnish companies consider IC management an important issue but feel that they lack the tools to support it. In fact, the development of appropriate measures was brought up as the most important development target. In addition, a recent study by Chiucci and Montemari (2016) identifies the perceived fragility of IC indicators as the reason for practitioners' lack of enthusiasm.

What then should change for IC and ICA to become worthwhile for firms? Echoing the Editorial published in the *Critical Perspectives on Accounting* (CPA) 2009 Special Issue on Critical Intellectual Capital (Mouritsen & Roslender, 2009), we argue that part of the problem lies in the lack of useful and workable assessment tools. We thus propose that perhaps organizations are not applying IC in practice because the metrics available are not really doing what they promise. Given the limited time and resources practitioners have for adopting new tools and methods, the quality and relevance of the tools are of central concern.

Since the concept of IC emerged primarily to improve the understanding and management of knowledge-based resources in creating value (Guthrie, Ricceri, & Dumay, 2012; Mouritsen, Larsen, & Bukh, 2001), at the core of the entire research program is the concept of knowledge. Knowledge itself is an extremely complex and problematic concept that has been discussed in a multitude of disciplines, from philosophy to accounting and from information science to anthropology. A critical question is whether the current literature on IC has taken an adequate look at knowledge as the basis of human productive behavior or whether IC has been oversimplified, as suggested by Gowthorpe (2009). We argue that IC literature has taken a path of its own, building on the more or less practitioner-based works of the first-generation IC researchers, such as Edvinsson, Sveiby, Roos, Sullivan, Stewart, and others. In the process, the literature has neglected to address the essentials of the key topic of scrutiny: knowledge and its utilization for creating value in organizational contexts that are fundamentally socially constructed, institutionalized, and collective (Blackler, 1995; Brown & Duguid, 2001; Nonaka, 1994; Spender, 1998).

To address these challenges, we examine the characteristics of the optimal metrics for managing and measuring IC. While other recent studies have focused on the transmission and reception processes of IC indicators, in this paper, we zero in on the indicators themselves (Chiucci & Montemari, 2016). We argue that the solution is found in a thorough understanding of the specific qualities of knowledge as the means and the objective of work and organizing. Loosely following the logic of critical IC research (Alvesson & Deetz, 2000; Dumay, 2009), we begin with a critique of IC measurement. We then provide insight by examining the nature of knowledge in light of management studies literature. Based on the knowledge-based perspective, we put forth several challenges to measuring IC. Finally, we propose some criteria for the more adequate measurement of IC that serve as various options for developing measures that better reflect the change to knowledge-based work and knowledge-based value creation in organizations.

2. Critical appraisal of IC measurement

The field of ICA is multidisciplinary, and many measurement and reporting frameworks have been created for assessing and disclosing IC. For example, Andriessen (2004) reviewed 25 IC measurement systems and concluded that they are largely suited for addressing three distinct purposes—internal management, external disclosure, and statutory reporting. Ricceri and Guthrie (2009) examined 36 IC frameworks and classified them into two approaches: the stock approach whose aim is to establish the financial value of intangibles, and the flow approach whose aim is to contextualize knowledge resources. More recently, Abhayawansa (2014) reviewed 20 frameworks and guidelines for the external reporting of IC (most of which are also recommended for internal management purposes) and divided them into three categories:

- Those that comprehensively explain firm value creation processes and highlight corporate objectives and business strategies, such as MERITUM (2002), the Danish Guideline (Danish Ministry of Science Technology and Innovation, 2003), the agriculture risk coverage-individual farm coverage (ARC-IC) model (Koch, Leitner, & Bornemann, 2000), the German guidelines for small- and medium-sized enterprises (SMEs; Alwert, Bornemann, & Kivikas, 2004), InCaS (Fraunhofer IPK, 2008), the Japanese intellectual asset-based management (IAbM) model (Japan Ministry of Economy, Trade and Industry, 2005), and the International Integrated Reporting Council (IIRC) Framework (International Integrated Reporting Council, 2013a,b);
- Those that do not particularly explain the firm value creation process but highlight the importance of IC indicators with reference to corporate objectives and strategy; for example, the IC index (Roos, Roos, Dragonetti, & Edvinsson, 1997), the IC Rating[®] (Jacobsen, Hofman-Bang, & Nordby, 2005), and the European Federation of Financial Analyst Societies Commission on Intellectual Capital (EFFAS-CIC, 2008);

- Those that recommend the disclosure of IC indicators without linking them to corporate objectives and business strategies, such as the invisible balance sheet (Sveiby, 1989), the Intangible Assets Monitor (Sveiby, 1997), the Skandia Navigator (Edvinsson, 1997), and the Intellectus model (IADE-CIC., 2003).

Our paper continues the discussion laid out in the CPA 2009 Special Issue, which makes several contributions to the assessment of the positive and negative qualities of ICA as well as the external reporting of IC. Nielsen and Madsen (2009) demonstrate that too much supplementary IC information may be counterproductive as it increases complexity, decreases the transparency of the disclosed information, and makes interpreting reports a challenging task for users of IC reporting. A management-driven perspective that aims to disclose only carefully selected information may increase transparency by decreasing the complexity of the reported IC. However, it may also create a “tyranny of transparency” (Strathern, 2000), as managers may choose to disclose IC information that is considered as the most important by them but not by the actual users of IC reports (Nielsen & Madsen, 2009).

Gowthorpe (2009) adds that “intellectual capital” is in fact an incomplete term. In financial accounting vocabulary, capital is calculated by deducting liabilities from assets, whereas IC models to date have regarded only intellectual assets and ignored the dark side of IC, including associated liabilities and risks. Gowthorpe also argues that due to its underlying knowledge component, it is impossible to measure IC as it exists mainly in intangible and immeasurable forms. She suggests that perhaps invisible and intangible IC should not even be made visible for managerial control and measurement purposes, as people do not wish to be measured (Sveiby, 2001) and it could raise ethical issues.

McPhail (2009) adds to Gowthorpe’s concerns about the lack of a discussion on ethics in IC literature. Although IC research almost completely overlooks the ethics debate, some companies disclose ethics as an intangible capital with productive capability. McPhail also challenges researchers and managers to come up with new ways of treating employees genuinely as human beings, valuable in their own right, instead of as mere IC resources. Roslender and Stevenson (2009) believe that narrative approaches, such as the Danish Guideline (Danish Ministry of Science Technology and Innovation, 2003) and MERITUM (2002), have led to major development in this area by offering alternative approaches to “accounting for people” and highlighting the needs of people rather than simply accounting.

Mårtensson (2009) looks at IC through the lens of political arithmetic, which is marked by the idea of balance, the search for correlations, and the conception of human nature. She points out that the current approaches for measuring value-creating capital are imbalanced (e.g., the balanced scorecard; see, Kaplan & Norton, 1996), as financial factors are heavily overvalued. Managers who understand the importance of intangible value contributors do exist, but they are often held back by the lack of workable IC measures. The current approaches also pose problems with regard to the search for correlations between IC and value creation, because several aspects of IC are largely immeasurable (e.g., human capital). Further, if IC information is measured using a questionnaire, it leads to the risk that the surveyed individuals may not provide truthful answers. Thus, measurement errors are more than likely to exist.

Searching for correlations without understanding the very basic challenges in the measurement of IC might provide unreliable information about the value creation of a company. The conception of human nature also seems to be a controversial issue in the current IC accounting approaches: The human factor is widely recognized as the most valuable resource in organizations, but, in accounting terms, it is regarded only as a cost. In addition, following the same line of thought as Gowthorpe (2009) and McPhail (2009), Mårtensson (2009) voices her concerns about the potential adverse consequences of using humans as objects of measurement.

Thus, in sum, although many measurement frameworks have been proposed for IC, these approaches have many problems, stemming from a wide set of issues ranging from data reliability to underlying philosophical considerations and from ethics to the intra-organizational division of power. With this critique in mind, we revisit knowledge in organizations and organizing in order to propose new ways forward for IC and ICA research. In particular, inspired by the critique presented in the CPA 2009 Special Issue, we go a step further and analyze the problems of IC measurement from an explicitly knowledge-based perspective. In the following section, we identify and discuss four characteristics of knowledge that should be taken into consideration when measuring IC: the multi-dimensionality of IC, human agency and action, contextuality, and the temporal and dynamic nature of knowledge.

3. Knowledge-based challenges and implications for IC measurement

In this section, we begin by revisiting the foundations of knowledge in organizations and organizing in order to provide insight into what implications these tenets of the knowledge-based perspective might have for measuring IC. Following that, we outline more specific implications for IC measurement and discuss the specific issues that IC assessment and ICA should consider so as to fully embrace the features and challenges of knowledge. Table 1 summarizes this discussion along with the measurement challenges, the measurement criteria, and the applications of the different characteristics of knowledge.

3.1. Multi-dimensional nature of knowledge

3.1.1. Challenge for measurement: The epistemology of knowledge as a multi-dimensional asset

A starting point for understanding how knowledge should be measured is the *epistemology* of knowledge—knowledge and our perception of it. Existing knowledge-based literature has begun to form a consensus on the nature of knowledge, but

Table 1
Knowledge characteristics and IC measurement.

Characteristics of knowledge	Measurement challenges	Measurement implications, criteria, and applications
<p>Multi-dimensionality Single-item IC indicators cannot capture the multi-level, multi-dimensional nature of knowledge</p>	<p>How to account for different types and forms of knowledge How to analyze knowledge at different levels How to address knowledge stocks or assets as well as knowledge embedded in routines and capabilities How to address the “dark side” of knowledge</p>	<p><i>Multi-level measurement:</i> Introduce relevant individual- and group-level measures, firm-level measures, as well as system-level measures <i>Stock and flow differentiation:</i> Include asset/stock and capability/practice measures in the measurement system <i>Recognizing the heterogeneity of IC:</i> Recognize the value, reliability, and political/moral aspects of knowledge <i>Performative measures:</i> Measure IC performance in its actionable context, and complement the measures with narratives and visualization to improve contextuality <i>Tailoring:</i> Develop measures that work for the benefit of managers and those who are being measured <i>Self-accounting:</i> Use indicators shaped by the needs of people (rather than by accounting or management) <i>Future orientation:</i> Measure IC's potential, not just as it currently stands</p>
<p>Human agency and action Valuable knowledge is acted upon and appears more often in performative than in ostensive form Knowledge is dispersed throughout the organization Although the knowledge possessed by humans is seen as the most valuable resource of a firm, current IC approaches overlook or underestimate its importance</p>	<p>How to examine intangibles as embodied in diverse forms of human agency and actions How to measure knowledge-in-action or in-use How to measure IC in a way that is more beneficial for those who are measured</p>	<p><i>Look backward:</i> Build and gather collective narratives and experiences of IC to understand how it is constructed <i>Internal collective construction:</i> Develop measures based on collective strategic vision and intent, using, for example, cognitive maps, narratives, and visualizations</p>
<p>Contextuality Collectively shared tacit knowledge is strategically the most crucial type of knowledge Valuable knowledge is characterized by complementarity and interdependency Context influences knowledge</p>	<p>How to address the value and relevance of IC assets in their local and institutional context How to address the extent to which different IC assets are dispersed and shared across a firm How to identify complementarities and dependencies between different pieces and types of knowledge possessed by various actors</p>	<p><i>Repeated measurement:</i> Conduct the measurement at set intervals to achieve time-series and panel-data measurements <i>Focus on renewal potential:</i> Assess the ability to change, not just change itself <i>Re-assess the measures:</i> Periodically adopt new measures to suit the changing internal and external demands</p>
<p>Temporal and dynamic nature of knowledge The value and substance of knowledge changes over time Knowledge about the present may or may not be considered as knowledge about the future</p>	<p>How to know what knowledge is valuable and applicable now and in the future How to measure something that is continuously and inherently changing (the dynamic nature of IC)</p>	

these insights are worth revisiting as they may not be getting utilized to their full potential in current ICA approaches. The knowledge-based perspective differs from other strategic management approaches by explicitly considering knowledge as its basis. Within this perspective, scholars have assumed that knowledge is the most important factor in production (Grant, 1996; Spender, 1996a). Moreover, researchers believe that performance differences between firms exist because of differences in the firms' stock of knowledge and capability of using it (Grant, 1996; Nonaka & Takeuchi, 1995; Spender & Grant, 1996). The *raison d'être* of firms is providing suitable conditions for the creation and transfer of knowledge and, ultimately, for transforming knowledge into a competitive advantage (Kogut & Zander, 1992).

A key conceptual challenge for measurement is that *knowledge is demonstrated in many forms and types*. The best-known categorization of knowledge is its division into explicit and tacit knowledge; this was originally articulated by Polanyi (1966) and later popularized by Nonaka (1994) and Nonaka and Takeuchi (1995). This categorization and its implications are particularly important from the ICA perspective. Explicit knowledge refers to knowledge that can be expressed and codified relatively easily, such as verbal accounts, numbers, formulas, and theoretical models. This type of knowledge is rational, formal, and systematic, and can be easily transferred from one person to another. It can be stored in libraries, databases, and other non-human repositories of knowledge. However, most human knowledge is in the tacit form, that is, we know more than we can ever possibly articulate. Tacit knowledge is personal, context dependent, and based on practice and experience. This kind of knowledge is very hard to formalize and communicate (Nonaka, 1994; Nonaka & Takeuchi, 1995). Explicit knowledge is easy to appropriate as it can be quickly communicated and diffused (especially in digital form), while tacit knowledge is not as easily transferable (Brown & Duguid, 2001; Szulanski, 2003). Thus, in some contexts, tacit knowledge might comprise a greater portion of an organization's intellectual asset base. The key challenge in such cases is that tacit knowledge is extremely difficult to measure since it is not explicit or is even immeasurable (e.g., Gowthorpe, 2009).

Knowledge also exists on many *analytical levels*. For instance, there is knowledge that is held by individuals and knowledge that is held at a social level and shared by many people. For example, Spender (1996a,b) proposed a classification of

knowledge types which combines two dimensions—explicit vs. tacit knowledge and individual vs. social levels—to distinguish between four types of knowledge. Conscious knowledge consists of facts, concepts, and frameworks that individuals can store in their memory and retrieve more or less at will. Automatic knowledge includes perceptions, mental models, values, behavioral tendencies, and kinesthetic and technical skills that are unconscious or semi-conscious and almost impossible to access consciously. Objectified knowledge represents the shared body of codified knowledge. Collective knowledge consists of knowledge that is embedded in various forms of social and organizational practices and resides in the tacit experiences and enactment of the collective.

In a similar vein, Kogut and Zander (1992) present a distinction between knowledge that is “know-that” and knowledge that is “know-how.” Know-that refers to information, descriptions, and declarative knowledge, while know-how refers to procedural knowledge of how something happens or can be done. These knowledge types can be further divided into individual, group, organizational, and network. In this form of classification, the principles of higher-order organizing are especially important (Kogut & Zander, 1992). These principles help create the context of thought and action in an organization and help govern how work and relationships are conducted. In management literature, this type of knowledge is mostly seen as being tacit and collective and is conceptualized as organizational *routines and capabilities* (Nelson & Winter, 1982; Teece et al., 1997). In contrast to seeing knowledge as a stock, this perspective implies that knowledge is embedded in the collective activities of a firm (Kianto, 2007). Therefore, it is important to recognize that knowledge is also embedded in bundles or routines and composes various types of organizational capabilities, which makes its measurement particularly challenging.

Finally, multi-dimensionality is not only about the various forms and types of knowledge but also about its more or less beneficial qualities. Something that has been almost entirely overlooked in ICA literature is the *dark side of knowledge and IC*. Although knowledge is typically seen as something liberating, positive, and progressive, it can also be a source of inertia, oppressive power relationships, and stagnation. In other words, as Mouritsen and Roslender (2009, p. 802) put it, “all knowledge is not good knowledge... Managers are as much concerned with barring ideas from becoming too accepted as with promoting ideas and knowledge.” Further, the same piece of information may be seen as knowledge, gossip, exaggeration, “an alternative truth,” or even a lie, depending on the evaluator’s perspective. Alternatively, an organization may not be able to convert the potential of its human capital into future revenues. Overall, a discussion on such intellectual liabilities (Caddy, 2000; Giuliani, 2013; Gowthorpe, 2009) is not strongly represented in existing discussions on ICA.

3.1.2. Implications for measurement: A more comprehensive framework for IC

Trying to create simple and practical IC measurement tools is a worthwhile endeavor; however, given that knowledge is multi-dimensional, it is unlikely that single-indicator measures (such as the subtraction of the book value from the market value or its variants, R&D investments, and the like) can sufficiently portray knowledge. Financially oriented ICA literature tends to favor such minimalistic, objective, and pecuniary measures. In contrast, in more managerially oriented ICA literature, there have been notable attempts to develop comprehensive measurement systems (e.g., Danish Ministry of Science Technology and Innovation, 2003; Fraunhofer IPK, 2008; International Integrated Reporting Council, 2013a; MERITUM, 2002). These frameworks divide the phenomenon into several components (such as human, relational, and structural capital) and propose a set of indicators for each component.

A comprehensive system of IC measurement would account for the multiple levels (individual, group, organizational, etc.) at which knowledge exists. Although the analysis at the organizational level seems to be the norm, for some issues (e.g., specialized skills and individuals’ social capital), analysis at the individual or group level might make more sense. Alternatively, in some cases, metrics that address the inter-firm network or system level may provide more useful information (see e.g. Basole, Huhtamäki, Still, & Russell, 2016). Paying attention to and accounting for the different levels of analysis seems to be neglected in current ICA discussions.

Furthermore, the measurements of IC should view it more comprehensively by analyzing it in the form of assets and stocks as well as the practices and activities of an organization (see, e.g., Kianto, Hurlmelinna-Laukkanen, & Ritala, 2010; Kianto, Ritala, Spender, & Vanhala, 2014). This approach has sometimes combined the concepts of IC and knowledge management to establish a multi-dimensional view in which IC represents a more static view of a firm’s resources and knowledge management represents the organizational processes and practices (Hsu & Sabherwal, 2012; Inkinen, Ritala, Vanhala, & Kianto, 2017; Mouritsen et al., 2001; Seleim & Khalil, 2011).

As previously noted, intangibles not only have benefits but also carry risks—IC can not only create but also destroy value (Giuliani, 2013). For example, the loss of a firm’s reputation, workplace bullying, or the ineffective protection of intellectual property rights can lead to serious problems. On the other hand, less graceful human characteristics, such as greed, duplicity, and cunning, may result in significant gains for a firm, for example, some successful business leaders are known for their quasi-narcissistic characteristics (Gowthorpe, 2009). Therefore, a more realistic view of IC is recommended by acknowledging its darker side. Caddy (2000) recommends doing this by examining how issues such as poor strategic planning processes, dangerous work conditions, and poor corporate reputation may impact an organization’s IC. Giuliani (2013) provides evidence for utilizing causal mapping as a dynamic method for tapping on the value destructing aspects of intellectual liabilities.

3.2. Human agency and action

3.2.1. Challenge for measurement: Knowledge as a product and vehicle of human agency and action

Another integral characteristic of knowledge is its human nature (e.g., Nonaka & Takeuchi, 1995; Polanyi, 1966; Spender, 1996b). Knowledge does not exist as a universal abstraction floating out there somewhere outside the knowing subject—rather, it is situated in specific local contexts and distributed across an organization among individual knowledge workers and communities of practice (Blackler, 1995; Brown & Duguid, 1991; Lave & Wenger, 1991; Tsoukas, 1996). The locus of expertise is viewed fundamentally differently in knowledge work than in traditional work: In the latter, expertise is located at the top of the hierarchy, whereas in the former, expertise is in the hands of the knowledge workers themselves and distributed across an organization.

In other words, knowledge is a fundamentally human issue—it is both the product and the vehicle of *human agency and action*, bounded by the limitations of human cognitive and other psychological capacities as well as by the social and cultural environment of the activity. From this perspective, knowledge is thoroughly pragmatic. In contrast to the classical Socratic/Platonic definition of knowledge as a “justified true belief,” the knowledge perspective centralizes usefulness as a criterion for what can be classified as knowledge. Knowledge is, essentially, a tool used for a specific purpose (Polanyi, 1966). As Spender (1996b, p. 64) succinctly puts it, “knowledge is less about truth and reason and more about the practice of intervening knowledgeably and purposefully in the world.”

Tacit knowledge is demonstrated in skilled action and unconscious judgments, and separating tacit knowledge from the activity as part of which the knowledge is demonstrated is very difficult (Polanyi, 1966). This means that *knowledge is essentially connected to action and application*—that which is known is demonstrated in knowledgeable activity. Cognition and action go hand in hand. Knowledge is acquired and demonstrated in action (Crossan, Lane, & White, 1999; Dougherty, 1992; Leonard-Barton, 1995; Orlikowski, 2002; Spender, 1996b). Blackler (1995) even argues that rather than regarding knowledge as something that people or organizations have or possess, it is far more useful to regard knowing as something that they do. The most valuable kind of knowledge is that which is demonstrated in knowing and skillful behavior rather than that in which it is stored, for example, databases and patents. At the organizational level, competitive advantage flows not from the resources themselves but from the firm’s ability to use those resources for productive purposes (e.g., Grant, 1996; Kogut & Zander, 1992; Penrose, 1959; Spender & Grant, 1996).

Finally, given the embeddedness of knowledge in human agency and action, the measurement of knowledge can also better adapt the *perspective of those who are measured*. Typically, traditional IC measurement and ICA aim to provide information for stakeholders other than those who possess the knowledge (i.e., employees)—these include managers, owners, and other high-level stakeholders who are provided information about IC (e.g., Edvinsson, 1997; Jacobsen et al., 2005; Pulic, 2000; Roos et al., 1997; Stewart, 1997; Sveiby, 1989; Sveiby, 1997). Therefore, we see much potential in approaches that better account for those who are the subjects of measurement.

3.2.2. Implications for measurement: Focus on the individual

Recognizing that knowledge is inherently rooted in human agency and action has major implications for the sound measurement of IC. Without the actualization of knowledge in terms of skilled action, knowledge remains redundant and, literally, useless. Kannan and Aulbur (2004) criticize financial metrics for not clarifying where problems exist or the value contribution of different IC components and, therefore, for not providing clear roadmaps specifying what corrective actions should be implemented. Other authors such as Eccles and Mavrinac (1995) criticize financial accounting for placing too much emphasis on tangible resources and for its inability to pay attention to total value generation and the growth potential of a company. In a controversial paper, Catusús, Ersson, Gröjer, and Wallentin (2007) propose that mobilizing and enacting should be acknowledged as additional phases in the IC measurement process so as to ensure that measurement information is transformed into actions. In this regard, we propose four specific measurement implications: a performative measurement approach, the individual-level fit, a participatory and reflective measurement design, and a future-oriented outlook.

The first implication of the above is that *knowledge needs to be measured as a performance or activity rather than as an object*. Mouritsen (2006) establishes that IC can be viewed either from an ostensive (what it is) or performative (what it does) perspective. These perspectives apply to the measurement of IC as well, while the latter approach is likely to be more valuable and equally challenging. Tacit knowledge is demonstrated in skilled action, and it is very difficult to separate this type of knowledge from the activity as part of which the knowledge is demonstrated (Crossan et al., 1999; Dougherty, 1992; Orlikowski, 2002; Spender, 1996b). Accordingly, Spender and Marr (2006) argue that performance “needs to be understood in the context of it being integrated into, and as a constituting part of, the production function. Hence, performance measurement and human capital must be based on the specific system of practices internal to the firm” (p. 265).

Spender and Marr also offer activity-based accounting as a possible solution, but this strand of research is in its infancy and does not yet offer developed tools. Thus, because the identification of tacit knowledge is problematic, its measurement promises to be even more so. Therefore, there is a need to critically assess whether measuring tacit knowledge itself is relevant, or whether the measures should actually target the activities that are enabled with the tacit knowledge held by individuals within an organization. For example, is it worthwhile to measure human capital *per se*, or would it be more valuable to know what an organization has managed to do with the human capital it possesses (the same issues, of course, relate to other dimensions of IC – structural and relational capital)?

A performative approach to IC could be the answer to the increasing calls for a more ethical and human approach to measuring IC (Gowthorpe, 2009; McPhail, 2009; Sveiby, 2001), as this approach does not treat employees unfairly as mere objects of managerial control. As stated above, knowledge is more of a performance or activity than an object and should therefore be assessed as such. According to Mouritsen et al. (2001), IC as a practice is about the activities (e.g., employee development) undertaken by managers in the name of knowledge. However, such activities cannot be captured completely only with measurements and, again, pure measurement alone can be complemented with more socially aware approaches such as narratives, stories, sketches, and visualizations (Mouritsen, 2006; Mouritsen et al., 2001).

Mouritsen et al. (2001, p. 745) define a *knowledge narrative* as “a presentation of the firm’s knowledge resources focusing on how they interact and allow the firm to be capable of doing certain things for external users. It thus both has a proposition of the firm’s ‘production function’ and of the value proposition supplied to users.” *Visualization* refers to “a sketch, which provides an illustration of the work of intellectual capital” (Mouritsen et al., 2001, p. 745). Overall, narrative and visual approaches to intellectual capital assessment are helpful in unraveling individuals’ subjective, abstract, and, often, tacit interpretations of organizations’ intellectual capital.

The second implication is that *the measures need to be tailored to fit specific individual contexts*. The knowledge-based perspective emphasizes the role of autonomous knowledgeable individuals as prime carriers and owners of knowledge. The knowledge governance theory (Foss, 2007; Foss, Husted, & Michailova, 2010) assumes that organizational conditions lead to organizational-level performance outcomes through their impact on individual employees and their behaviors. In other words, organizational outcomes are constructed through individual-level motivations, abilities, opportunities, and actions, making the micro-foundations of knowledge-based phenomena especially important topics to understand.

If organizational actors are to learn and develop based on IC assessments, then it is important that the analysis is focused and pinpoints key challenges in different loci of the organization. The challenge to measurement, then, is to include a large enough sample of employees, managers, as well as different teams, organizational units, and geographic locations. In addition, one should consider what kind of metrics should be used for people performing different tasks and whether all metrics apply to all organizational units. In practice, this means (a) collecting data from a sufficient set of variables related to demography, background, and job status, allowing for a more granular grouping of the measurement data; (b) potentially constructing unique metrics for each relevant group in case it is assumed that, for example, human capital for different types of employees should differ.

Existing measures take this into account to some extent. For example, IC Rating™ (Jacobsen et al., 2005) examines managers and employees as separate groups, and the Intangible Assets Monitor (Sveiby, 1997) divides employees into key personnel who are examined under “employee competence” and support personnel who are placed in the “internal structure” category. Several such internal groupings could be useful for the interpretation and actionability of the measurement results.

The third implication relates to *self-accounting*. This means that *those who are being measured should participate in developing the measures*. As a growing number of professions can be regarded as knowledge work, this approach is becoming the norm rather than the exception. Therefore, to improve reflexivity and learning, what gets measured and how it is measured should make sense to those who are meant to be the ones learning. The employees themselves are the best experts and developers of their work. Thus, instead of only emphasizing the managerial control perspective, ICA should also focus on accounting for people and assess the needs of the people rather than simply accounting (Roslender & Stevenson, 2009). At the very least, employees should understand the content of the measures and agree that the measures used are relevant to them. This idea implies an emic rather than an etic approach to measurement, which should satisfy not only the scrutiny of an external evaluator or supervisor looking at the system from above and outside but also the contextualized self-understanding of the local actors themselves. From the perspective of the users of IC reports, measuring and reporting should be conducted transparently, and the disclosed information should be relevant to the users (Nielsen & Madsen, 2009). Furthermore, such evaluations should be performed with care as people do not like being measured (Sveiby, 2001).

Chiucci (2013) and Chiucci and Dumay (2015) recommend involving managers in designing IC indicators. However, we suggest going a step further and involving non-managerial employees in the hope that they too will learn during the process (Roslender & Fincham, 2004). In effect, the key goal here should be boosting the learning and development of non-managerial employees, as they are the ones likely to do most of the value-creating work in an organization.

Finally, the fourth implication is that *in addition to examining existing skills, addressing potential knowledge and competencies of the future are also important*. Knowledge is related not only to actions and decisions made today but also to emergent future possibilities and potential—the not-yet-embodied or the self-transcendent (Scharmer, 2001). Therefore, the measurement of IC requires more future-oriented and transformation-based approaches than what transaction-based and retrospective traditional accounting can offer (Chatzkel, 2003).

Spender and Marr (2006) stress that understanding what constitutes skilled performance in the context of the prevailing circumstances is only the first step. What is also required is understanding the potential for skilled performance under circumstances that have yet to appear. In other words, although it is important to understand what is known at present, it is also important to understand the “zone of proximal development” (Engeström, 2001) or, in the space of potential possibilities, what kinds of paths or real options (Kogut & Kulatilaka, 2001) are open to the actor or firm in the (near) future.

Understanding potential capabilities is particularly important as the environment is unpredictable and changes rapidly. However, if not completely impossible, it is, at the very least, extremely challenging and difficult to measure potential knowledge or competencies needed in the future. Thus, it is important to recognize how well an organization is prepared

to meet the challenges that might arise from unforeseen events. For this, organizations can employ measures that take into account renewal capital (i.e., the organization's ability to renew itself; see, e.g., Kianto, 2008).

3.3. Contextual nature of knowledge

3.3.1. Challenge for measurement: Knowledge as an institutional and collective phenomenon

The institutionalization of knowledge is inbuilt in that effective action always takes place in a particular context. Human beings are fundamentally social animals, and specific socio-historical contexts set the boundaries for individual understanding and behavior, while individuals regenerate and modify the context by enacting it (Giddens, 1984). Even when we are alone, our culture and communities influence us in the form of internalized conceptions, mental models, attitudes, and values. Indeed, individuals neither think nor take action in a vacuum—knowledge is embedded and constructed in shared practices by interacting individuals who combine their efforts while striving toward common goals (Berger & Luckmann, 1966; Crossan et al., 1999). In this sense, even when knowledge is held by an individual, it is strongly socially conditioned and constructed. Issues that are especially complex require the integration and coordination of knowledge across many individuals (Grant, 1996). For instance, producing a product or service typically requires the application of many types of knowledge resources (Grant, 1996; Grant & Baden-Fuller, 2004; Kogut & Zander, 1992).

Thus, although different typologies and taxonomies attempt to measure IC in a universal way, it is good to recognize the challenge that *knowledge is always a contextual phenomenon, with strong local and institutional components*. First, all organizational life is a social construction wherein the value of specific resources, skills, and knowledge is collectively assessed. This means that no knowledge is useful in isolation—its applicability is demonstrated only when other organizational actors view the knowledge as applicable in value-creating processes. Second, the value and applicability of knowledge are institutional issues. In general, institutions differ across organizational and societal contexts in terms of regulative, normative, and cultural-cognitive dimensions (Scott, 1991, 1995). Institutions have a major effect on how human agency and decision-making are valued and framed (Wiseman, Cuevas-Rodríguez, & Gomez-Mejia, 2012), and they thus determine the relative valuation and applicability of knowledge.

Based on these contextual challenges, Schaper's (2015, p. 75) contention that “pushing a general model for measuring IC might not provide expected results in the involved organizations” seems justified. As a remedy, in the IC literature, there is a strong conviction that the measures should be derived from a firm's organizational strategy and be connected to its value-creation logic (Mouritsen et al., 2001; Stewart, 1997; Sullivan, 1998; Sveiby, 1997). From these perspectives, organizations are emphasized as strategic, goal-oriented entities rather than free-floating collections of stocks and flows. On the other hand, the drawback is that IC measurement systems and reports tend to be so idiosyncratic that it is difficult to make cross-comparisons between organizations and interpret whether a given measurement indicates a positive or negative trend.

A major challenge for the measurement of IC is that relevant knowledge is always *dispersed throughout an organization*. Human beings are bound by cognitive limits in terms of how much and what they can know and, therefore, they have to specialize in certain areas of knowledge (Grant, 1996; Simon, 1990). Thus, no single mind can master all the organizational knowledge and foresee an organization's future knowledge needs. Therefore, an organization is by necessity a fundamentally distributed knowledge system (Tsoukas, 1996; Tsoukas & Mylonopoulos, 2003). For these reasons, each member of an organization is likely to possess some knowledge that no one else has, and therefore measuring IC with a focus on just a few individuals is problematic.

Finally, a related challenge for IC measurement is recognizing the *complementarities and interdependencies of knowledge held by different actors*. Given the aforementioned specialization of knowledge work, a core function of organizations and organizing is to manage, integrate, and coordinate employees' knowledge (Grant, 1996; Kogut & Zander, 1992; Penrose, 1959). Considering the largely tacit nature of knowledge and its dispersal among a variety of individuals and across different contexts and the multitudinous normative expectations, knowledge cannot be fully managed in the same way as other types of resources. Instead, knowledge management resembles the creation and cultivation of suitable contexts (Von Krogh, Ichiko, & Nonaka, 2000). Accounting for interdependencies and complementarities is therefore a critical challenge.

3.3.2. Implications for measurement: Focus on the collective

The problem of measuring knowledge given its contextual and collective nature is twofold. First, it has been well reported that the social environment significantly influences the extent to which individuals invest their time and effort in achieving organizational goals. Measures depicting individual propensities convey only what the individual potential is—and even this is defined narrowly. The measures do not address whether or how widely an individual uses these latent capacities to perform a given task. By assessing the socially constructed features of the environment, a valid analysis can help determine how the situation could be improved to better allow and encourage the enactment of individual skills and competencies. One option for measuring collective knowledge (i.e., social interaction and knowledge between people) is to use peer assessments. Another approach is to use multiple respondents per organization, as some authors have opted to do (Bollen, Vergauwen, & Schnieders, 2005). This approach generates an aggregated view of target organization.

Second, collective or shared tacit knowledge is strategically the most important type of knowledge (Spender, 1996b); therefore, this type of knowledge too should be measured. Collective knowledge consists of knowledge embedded in different forms of social and organizational practice, residing in the tacit experiences and enactment of the collective, such as routines (Nelson & Winter, 1982). Individual actors may be unaware of such knowledge even though it is accessible and

sustained through their interactions (Spender, 1996a,b). Consequently, collective knowledge can be studied by examining the relational patterns among organizational actors and the principles on the basis of which they collaborate (Grant, 1996; Kogut & Zander, 1992). Shared operating methods are inimitable across firms and, therefore, these methods are a sustained competitive advantage. For example, innovations may be copied by competitors, but the innovativeness embedded in the organizing principles and patterns of social interaction cannot be copied. However, very few measures have been created for collective knowledge; it appears to be a very daunting factor to quantify.

One solution is to look at history. Promising methods for including collective views in IC assessment are to use narratives and organizational participants' own lived organizational experiences to describe social interactions, knowledge between people, collective knowledge, and to make sense of the context (Dumay & Roslender, 2013; Mouritsen, 2006; Mouritsen et al., 2001; Roslender & Finchman, 2001).

For managerial control, the IC measurement system should have an integral link with a firm's strategy and related measures (Zack, 1999). According to the resource-based view of strategy (from which the knowledge-based view has emerged), performance differences between firms are due to differences in intra-firm characteristics rather than market positioning. Consequently, strategic decision-making requires an evaluation of a firm's resources and capabilities rather than external markets. This implies that to allow learning and development, indicators should be chosen based on organizational strategy and not external demands. Recent views on organizational strategy as collective cognition (Helfat & Peteraf, 2015; Tyler & Gnyawali, 2009) further support the idea that the *focus should be on internal and collective constructions rather than on external and standardized views.*

Indeed, it seems that managers' greatest interest is in utilizing IC metrics for internal firm development rather than external communication (Kujansivu, 2008), evidenced in part by the nearly complete disappearance of public IC reports since the early 2000s (Dumay, 2016). In such cases, where the focus is on the internal (e.g., internal development) and not external (e.g., comparison between organizations), softer and more socially constructed assessment methods could be applicable. These methods include the cognitive mapping of managers' collective cognition and strategic intent (Tyler & Gnyawali, 2009) as well as previously discussed narrative and visualization techniques (e.g., Mouritsen et al., 2001). As stated by Mouritsen et al. (2001), IC is more than just about static issues—it is also about the actions and activities of an organization. Such activities are complex sets of interventions performed by managers, for example, and cannot be captured easily—if at all—through pure measurement.

3.4. Temporal and dynamic nature of knowledge

3.4.1. Challenge for measurement: Knowledge is an ever-changing, temporal phenomenon

Most ICA approaches attempt to measure, quantify, and concretize knowledge assets. This pragmatic choice—and perhaps the burden of the accounting tradition, in which the transient nature of knowledge is a problem (Gowthorpe, 2009)—has led to the treatment of knowledge as a somewhat static and immobile asset. However, this static view does not conform to the fundamental nature of knowledge. Knowledge is dynamic: It is continuously reinterpreted and modified and is related to learning and change.

Tsoukas (1996) discusses the “indeterminacy of practice,” which means that there are no two completely identical situations, and the uniqueness of every activity's context requires that individuals continuously make some personal judgments. No matter how well defined the explicit rules and guidelines are, they still need to be assessed in light of the specific situation at hand. This brings an element of uncertainty to all instances of knowledge use or “knowing.”

Due to its subjective and socially constructed nature, knowledge is intimately linked to issues of power, politics, and conflict (Foucault, 1991). For example, there is often a struggle between competing conceptions of what constitutes legitimate knowledge (e.g., when different groups or individuals arrive at incompatible analyses of the same event; Hislop, 2005). In addition, although seldom explicitly addressed, the following questions may arise: Whose voice is warranted? Whose knowledge is legitimized? And whose can be dismissed as irrelevant, a misunderstanding, or even heresy? (Gergen, 1994).

Given the political and highly contested nature of knowledge, we argue that knowledge is inherently a *temporal* phenomenon. In other words, *the applicability of knowledge varies over time, and knowledge is bound by the interpretations of what is valuable now and in the future.* For example, what once constituted a firm's value-creating core competencies may later turn into harmful rigidities if they are not modified to match the prevailing conditions (Leonard-Barton, 1995). From the perspective of dynamic capabilities (Eisenhardt & Martin, 2000; Teece et al., 1997), there is a need for the continuous modification of organizational capabilities to maintain competitiveness under changing conditions.

Knowledge is clearly a volatile asset that can suddenly lose its value due to changes in technology, legislation, or the marketplace. Therefore, knowledge is bound by the interpretations of what is useful and valuable at present and in the future. Measuring something that is *inherently and continually changing* presents a formidable challenge. To meet this challenge, focus on the flows instead of the stocks (Bontis, 1999; Dumay, 2009; Kianto, 2007) might be more beneficial.

Indeed, crafting a set of performance measures for IC that follow the traditional logic of standardized and objective performance assessment is difficult because for knowledge-based constructs, the tasks are likely to be non-repetitive and cannot always be standardized. Furthermore, performance criteria are mostly concerned with the quality rather than the quantity of output (Drucker, 1999). It is commonly known that “quality” is hard to define in general terms and even harder, if not impossible, to measure. The usual parameters for evaluating quality are either output (e.g., customer satisfaction and peer reviews) or intra-organizational (e.g., commitment, employee job satisfaction, and trust within an organization). The

dynamic nature of knowledge makes it even harder to pin down: Because knowledge is altered, reinterpreted, and modified as it is used, it is impossible to define stable content-based yardsticks for judging the performance of knowledge workers.

However, the existing measures tend to examine IC as static possessions of an organization instead of as activities conducted by the actors or brought about by the act of organizing itself (Blackler, 1995; Kianto, 2007; Orlikowski, 2002; Tsoukas, 1996). Most of the literature on IC conceptualizes it as a static asset or stock (Bontis, 1999) and assumes that it is something that can be easily identified, located, moved, and traded like a package, albeit an intangible one. Lerro, Iacobone, and Schiuma (2012) express scorn toward IC models for providing only a snapshot evaluation of an organization's knowledge and thus reflecting only its static knowledge stocks without considering the dynamic element represented in the organization's knowledge flows. However, the challenge remains: How does one measure the development of IC instead of taking cross-sectional snapshots?

3.4.2. Implications for measurement: Hitting a moving target

A practical option for capturing the temporal nature of IC is to examine the processes of knowledge work rather than its outcomes. According to the knowledge-based view of strategy, value creation depends not so much on the knowledge resources *per se* but on how they are used (Kogut & Zander, 1992; Penrose, 1959; Spender & Grant, 1996; see also, Feldman & Pentland, 2003). Therefore, if the rationale behind organizational measurement is to improve a firm's value creation capabilities, the measurement should focus on the organizational practices in which resources are used instead of on the resources or assets *per se*, no matter how intangible and knowledge-related they may be.

An obvious solution is *continuous, repeated measurement*, which could be performed several times a year. Dumay (2009) suggests conducting measurements several times in order to track the changes in IC and the impact of development activities: "The benefit of taking a snapshot beforehand allows for the development and implementation of organisational interventions or probes that have the potential to influence the development of patterns of interactions that are desirable for the organisation. The subsequent post-intervention snapshot analysis will help the organisation understand which interventions were successful and which were not" (p. 203). Such an approach certainly helps in following the measurement over time and allows the use of various types of measures, including non-standardized ones. Of course, the challenge then becomes how to organize the measurement so that it does not consume too much of the time or resources of those being measured.

Alternatively, knowledge can be understood as emerging from ongoing social interactions. The focus then is not on knowledge resources as static assets or outcomes *per se* but on the *renewal potential* of an organization to leverage, develop, and change its knowledge assets. Some measures address this dynamic dimension as renewal capability or renewal capital (Kianto, 2008) or in terms of the dynamic practices by which knowledge is managed (Inkinen et al., 2017; Kianto et al., 2014). However, in order to depict the dynamic nature of capabilities or practices, these measures should be used more than once. In order to capture this dynamic nature and understand the dynamics of IC, a feasible solution includes longitudinal measurements and a complementary method for assessing IC (see, e.g., Dumay & Roslender, 2013).

Finally, as knowledge can swiftly become obsolete and core competencies can turn into core rigidities (Eisenhardt & Martin, 2000; Leonard-Barton, 1995), it is important that the *measurement scheme and its objectives are reassessed periodically*. As groupthink (Janis, 1972) and cognitive inflexibility can limit the ability to question prevailing strategies and methods of conduct, it may be beneficial to utilize non-routine knowledge sources for ensuring up-to-date understanding. Chiucci (2013) discusses the possibility of IC measures becoming obsolete because of changes in the business environment. The needs of the users of the information can also change (Chiucci & Montemari, 2016), and this change may or may not be related to environmental changes. In any case, making sure that the feedback and development loops work for IC measurements is very important, especially if the organization using them operates in turbulent conditions.

4. Conclusion

In the recent past, the usefulness of existing IC approaches has drawn some criticism, especially with regard to the applicability and utilization of IC measurement (Chiucci & Montemari, 2016; Demartini & Paoloni, 2013; Dumay, 2009, 2012; Guthrie et al., 2012; Schaper, 2015). In this paper, we suggest that the reason for practitioners' apparent lack of enthusiasm for IC may perhaps be the lack of suitable metrics. This does not mean that metrics do not exist (because they do, in vast numbers), but rather that the existing metrics do not really help managers to manage the knowledge of their organizations or to understand how value is created from IC. Furthermore, to other internal and external stakeholders, the usefulness of current information on IC is likely even less. To restore the value of IC measurement, and to mend the theory-practice gap, we revisited the knowledge-based perspective to develop a set of measurement challenges and criteria that could help move toward a more sound IC measurement.

Our paper loosely follows the logic of critical IC research as laid down by Dumay (2009), including a critique of existing IC measurement methods and insights drawn from a close reading of knowledge-related management studies literature. As a result, we have identified challenges in and proposed suggestions for improving IC measurement, with the aim to provide what is needed for a transformative redefinition of the field. In the following section, we recap our key propositions and discuss their wider implications.

4.1. Knowledge-based perspective of IC measurement

Based on the knowledge-based perspective, IC should be understood as multi-dimensional, activity-related, contextual, and dynamic. Each of these characteristics poses a set of implications for its measurement. Overall, this perspective is not only more compatible with but also outright demands the managerial rather than financial approach to ICA (Ricceri & Guthrie, 2009; Sveiby, 2001).

The first characteristic—the *multi-dimensionality of knowledge*—implies that the parameters used to measure IC should be tailored at the individual, group, organizational, and system levels. The IC of a team, organization, or system is not just a sum of its individual-level human capital; each level is influenced by various intra-organizational and extra-organizational contingencies, such as an organization's structure and networks.

Multi-dimensionality also means that the positive and negative aspects of IC should be measured in order to produce realistic measurement results. An organization may have, for instance, a large amount of knowledge available through its network, but a lot of network exposure also makes the company vulnerable to knowledge leaks and its key personnel being poached, for example. Both sides of the coin are equally important to consider when evaluating the true value of the different components of IC.

Moreover, knowledge or IC is not valuable as such—its value potential gets realized when it is used in decision-making or other key organizational processes. Comprehensive IC measurements should cover both stocks and flows—what IC an organization has access to and how well it utilizes it to create value and competitive advantage.

Human agency and action is the second category to which we wished to draw attention. Human agency refers to the fact that humans, or employees, form the core of IC and are arguably the most valuable sources of IC in an organization. Action means that the most valuable knowledge is acted upon and found in different parts of an organization. Employees' knowledge, and IC in general, is valuable only when it is used in value-creating activities, so it needs to be measured as a performance or activity rather than as an object. In other words, one very promising way to improve IC measurement is to focus more on what organizational goals or outcomes it helps achieve.

Moreover, as IC takes on several valuable forms and is embedded in various agents across and beyond an organization, a crucial objective of IC measurement is to identify and cover all of the sources of IC. In this regard, narratives and the visualization of knowledge can help put the knowledge in an actionable context in order to illustrate its impact and location. Employees and managers should be the focus when developing IC measures. IC indicators have been traditionally developed for accounting or managerial control purposes, overlooking employees who know best how their input and output development could be effectively measured. In addition, managers' needs should be the center of attention as they are the ones who should use the measurement results for improved decision-making.

Third, the *contextuality of knowledge* refers to the fact that the most valuable IC is collectively shared knowledge that resides between organizational actors through relationships and co-operation. Contextuality also refers to a multitude of contextual and institutional factors that influence the utilization and value of knowledge. In order to expose the most significant collectively shared knowledge, the measurement of IC should be able to address the IC that is most widely shared and used within an organization or network. For this purpose, narratives and experiences could be used as measurement approaches as they help to understand how knowledge between organizational actors is constructed. Social network analysis can also be used to gain an understanding of the knowledge-sharing patterns. All IC is not equally important to all companies; thus, IC measurement should be tailored to produce relevant measurement results in different contexts.

Finally, since knowledge is a *temporal and dynamic* factor of value creation, its measurement too should be dynamic, and the measures should be continuously reassessed and retooled. Our first argument regarding the temporal and dynamic nature of IC is that one-time measurement (e.g., cross-sectional data) does not provide academics or managers with an adequate understanding of how an organization's IC is developing and how its development influences the firm's performance outcomes. Multiple measurements at different points in time open up opportunities to examine the phenomenon longitudinally and to understand the true causal relationships between IC and firm performance.

In addition to change itself, as a difference between measurement point A and B, temporality and dynamics refer to the ability to conduct and manage change. Thus, organizational abilities to renew and replenish IC also form an important measurement object, which is likely to be more relevant to the extent that the organization is operating in rapidly changing environments. Finally, IC measures should be periodically reassessed to ensure that they measure the most relevant IC in an ever-changing world. If the existing “established” measures are only recycled, as IC research has predominantly done post-2000, there is a risk of losing the relevance of its research and practice and missing the moving target. Academic authorities and journals should encourage IC scholars to update the existing IC measures or develop new measures and measurement innovations.

Overall, we can observe an uneasy tension between the demands of reliability and validity or, in this case, the objectivity and relevance of IC measures. Although the financial metrics, at least at the outset, are reliable in terms of repeatability and transparency, their limitations in terms of validity have been well reported in the literature (Stähle, Stähle, & Aho, 2011). It may well be, as Gowthorpe (2009) states, that financial accounting cannot stretch far enough to provide useful IC measurement after all. The more managerially oriented metrics, however, when selected according to a specific company's needs, with consideration of the emic understandings of organizational actors and self-evaluations, may pose questions concerning reliability.

Perhaps the key issue of IC measurement is not the absolute accuracy of representation but instead the development of pointers that enable dialogue and action or mobilization and enacting, as stated by [Catasús et al. \(2007\)](#). This means that we should not stop at listening to the voices of only the external stakeholders or managers but also those of the employees who are after all the key actors involved in the creation of value-based knowledge in an organization ([Roslender & Fincham, 2004](#)).

As [Nielsen and Madsen \(2009\)](#) note, the IC debate has focused on the sender's side of communication and the message itself, while remaining silent about the recipient's side or the consumption of IC information and the transparency of ICA. In addition, according to [Roslender and Stevenson \(2009\)](#), IC has not taken into account the perspectives of those who are being measured. In this paper, we also briefly address the various audiences of IC measurements and their respective needs. Examining well-working metrics from the perspectives of various types of internal and external interest groups presents a worthwhile topic of further inquiry, and our suggestions for different approaches might be useful in this regard.

If IC measurements are intended to produce actionable information, they should make sense to the potential users of that information. According to [Mårtensson \(2009\)](#), the major reason for the downfall of human resource costing and accounting was that it became “more of a control instrument than an active management control system,” its efforts becoming mere numbers with no content. Fundamentally, it is not the measurement scores themselves that will have an impact—it is how they are used to generate dialogue and actions that will then produce a beneficial change in the direction sought, whatever it may be. In themselves, measurement scores and index numbers are mute and lame.

What we are proposing in this paper is a more complex, multi-sided, multi-voiced approach to ICA; in other words, a *knowledge-based perspective*. Naturally, this means that the task of assessing IC cannot be conducted neatly and quickly but is an effort-intensive process that requires wide participation. However, should intangibles really be the key driver of competitive advantage and value creation in contemporary organizations, such an effort would be justified.

4.2. Implications for future research and practice: From measurement to assessment

The phrase “what gets measured gets managed” is famous. However, perhaps in the context of IC, there is more than just the measurable components or, as [Dumay and Roslender \(2013\)](#) put it, numbers do not make sense on their own. Numbers can only capture the measurable components of IC, and without a complementary assessment, they provide only limited meaning ([Dumay & Roslender, 2013](#)). As mentioned above, the measurement of IC should move beyond traditional accounting to overcome what [Dumay \(2009\)](#) states is the problem of “accountingisation,” that is, an attempt to force intangibles into (preferably financial) numbers (see also, [Dumay & Roslender, 2013](#); [Mouritsen, 2006](#); [Mouritsen et al., 2001](#)).

To overcome the grave challenges that have cast a shadow over the field of IC measurement, it might be good to move from pure IC measurement to an *overall assessment* of IC, including measurement and complementary methods of assessment and disclosure. For example, as discussed earlier, [Mouritsen et al. \(2001\)](#) note that an IC statement should be more than just a set of numbers and should also include narratives and visualizations, for example. Together, different types of approaches for assessing IC within organizations, including non-numerical ones, should provide the chance to escape accountingisation.

This kind of comprehensive assessment allows the use of a quantitative orientation by utilizing numbers to categorize and depict inter-relationships in IC, while at the same time using narratives and other socially constructed means to make sense of the context. Such approaches have been called upon by [Dumay and Roslender \(2013\)](#); see also [Guthrie et al. \(2012\)](#) who suggest that IC research that goes beyond accounting should include more than just the measurement of IC. Adopting a more assessment-oriented approach does not necessarily mean that everything needs to be assessed and measured. [Mouritsen \(2006\)](#) suggests that future research should include and focus on “IC in action” rather than just attempting to develop new, all-encompassing IC frameworks. Focusing on such actionable measures might benefit from the development of more tailored, context-aware, and locally useful assessment tools.

In this paper, we adopt a critical approach for pointing out a set of issues that, from a knowledge-based perspective, are important but are not sufficiently recognized in the current ICA literature. We also provided recommendations for measurement criteria and application. We do acknowledge that although our paper poses many critical and difficult questions, it does not provide simple and clear-cut answers, for example, in the form of (yet another) set of indicators. However, our objective was not to provide one more measurement option for IC but to point out the potential problems, complexities, and trade-offs involved in the assessment of intangible assets along with some potential remedies.

Some of these problems might be insurmountable. However, acknowledging them and making informed decisions based on this awareness can go a long way toward ensuring that the adopted metrics help those who use IC measurement and accounting to better understand organizations and their value creation. Perhaps doing so would enable ICA to truly fulfill the definition assigned to it by [Guthrie et al. \(2012\)](#) as “an accounting, reporting and management technology of relevance to organisations to understand and manage knowledge resources.” We believe that the challenges we have identified along with the measurement criteria and application examples can help academics and practitioners better account for the underlying heterogeneous and complex knowledge-based features of IC.

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