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Intellectual capital, innovation and the bushy form of knowledge capitalisation

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Abstract

This paper analyses the relations between intellectual capital (IC) and innovation. It links interest in the macro-effects of intellectual capital, typically found in cross-sectional studies on the effects of intellectual capital, to micro-studies of the performativity of intellectual capital. The former literature suffers from a lack of attention to the mechanisms that produce innovation, and the latter suffers from its focus on stabilising decisions in uncertain situations. The paper draws on the notion of perlocutionary performativity, which, in addition to suggesting that IC provokes effects, underlines that particular directions of these effects are uncertain, if not unknown. To show the mechanism through which perlocutions work, the paper draws on Butler's (1993; 1997) distinction between citability and ex-citability. According to this perspective, a citation of an IC corpus of expressions (citations, references, information) may be transformed, by being circulated (re-cited) and brought into a new potentially innovative arrangement, something which goes beyond (ex-cites) the cited reference. Over time, IC citations provoke innovation. Such a relation can be traced as a bushy form of innovation, which develops from a set of IC citations that have some durability in being reproduced regularly. The paper shows, through the analysis of two decades of reporting from Autostrade, that IC is both a set of disciplined citations of a particular kind of use value, a set of obligations to invest along this use value, and an unpredictable capitalisation of items of innovation.

Keywords Intellectual capital · Innovation · Non-financial reporting · Performativity · Sustainability · Use value

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1 Introduction

> ... intellectual capital works as a melody, as a continuous flow of tones. To grasp and experience the melody one has to think ahead as well as back; weave together presence with past and future with external and internal relations. (Grafström & Edvinsson, 1999, p. 32)

Very early in the history of intellectual capital (IC), the concept's pioneer Leif Edvinsson proposed IC as a movement, which the above-quoted statement illustrates. As claimed by Edvinsson, IC works as a flow that links the past and the present, which implies that it is always in the process of becoming. In the becoming means that it does not settle as an outcome even if signs of its presence in numbers, texts and pictures may have durability. Its signs, its expressions in tools, such as in external and internal reporting systems, are important as stepping stones for new futures rather than representational disclosures of finite effects of IC. IC, when intended as the flow of references (citations) related to the firm's knowledge resources endowed with strategic resonance, concerns valuing (creating value) more than describing value (being value) (Mouritsen et al., 2001a). It is not a process of accumulation of knowledge elements in silos or black boxes, rather it is a process of capitalisation of knowledge, a melody of becoming, to paraphrase Edvinsson. This flow of references inspires and is inspired by a narrative which is concerned with the relationships between knowledge, its representations and its effects.

This melody of becoming has been lost in accounting research about IC. While by now, it is clearly recognised that IC can be understood as a fluid, complex, unimaginable and performative mediator (Abhayawansa et al., 2018; Corbella et al., 2019; Rooney & Dumay, 2016; Veltri & Bronzetti, 2015; Zambon et al., 2019), even with this approach, it is analysed as something to be domesticated and stabilised. This occurs through adding stabilising interpretation and narration to IC categories, indicators and their relations for decision purposes (Corbella et al., 2019; Zambon et al., 2019) or for sense-making purposes (Abhayawansa et al., 2018; Rooney & Dumay, 2016). While difficult, uncertain and ambiguous, the effect of engaging in IC is to stabilise its categories and their relations to develop stable conclusions and narrative links to numbers. This approach favours understanding IC as an information system needing interpretation because of its incompleteness (Busco & Quattrone, 2018a).

However, as Edvinsson proposes, IC is not only a system of categorical citations but also a melody, a movement linking the past and the future. This is important because the value of IC is then understood not only, or even primarily, in terms of the ability to make sense of its citations as an information system but also whether it does something to the world by adding a valuation endeavour that makes the future novel and thus ambiguous. As Edvinsson indicates, the future is not the linear effect of a decision. A future, however difficult it is, has to be interpreted and narrated, cannot be guaranteed by decisions that always risk running into unintended consequences (Boedker et al., 2019; Mouritsen & Kreiner, 2016). Therefore, the performativity of IC is not only in seeking its stabilisation as an

information system in the field, as the prevailing interpretation of performativity implies. It lies in the effects on the world that are produced by the ambiguous, narrated and imaginative courses of action. Thus, the value of IC as an information system is hardly or not merely in its domestication as a decision tool but also in the ambiguous effects in relation to the world—the capitalisation of knowledge—that develops through mobilisation of IC citations.

Therefore, it is useful to add to performative research about IC (Abhayawansa et al., 2018; Corbella et al., 2019; Rooney & Dumay, 2016; Veltri & Bronzetti, 2015; Zambon et al., 2019) a perspective that acknowledge Edvinsson's idea that IC moves things—it emulates and transforms history. IC works on matters that are already in their becoming. This is particularly relevant because the object of IC is knowledge (Fincham & Roslender, 2003; Garcia-Perez et al., 2020; Kianto et al., 2020; Lerro et al., 2014; Mouritsen & Larsen, 2005; Mouritsen et al., 2002) and it is concerned with the production of value through innovation and development of organisational capability (Buenechea-Elberdin et al., 2018; Lev, 2001; Mouritsen et al., 2001b; Ordóñez de Pablos & Edvinsson, 2018). The claim is that IC is a source of change in a knowledge-based and entrepreneurial economy (Drucker, 1984, 1991, 1993); therefore, it is useful to consider how IC performs towards the capitalisation of knowledge.

To develop this point, it is useful to understand IC as citation in Butler's (2010) sense of performative agency. A citation is not just a neutral piece of information, but a way of engaging with and potentially challenging existing dynamics. IC citations are incorporated by actors into their own work, not just to reference or acknowledge them, but to draw attention to the context in which those signs were originally used. In this sense, citations can be moved around and put into new programmes of action over time, themselves emerging from the IC citations. Butler (1993, 1997) states that citations may be turned into excitations or novel combinations and interpretations of citations of the past, which may lead to a process of capitalisation, moving IC into and out of, on top of and in relation to a transformation of the history in which it participates—the history of becoming. This excitability helps to enact the world in new ways and to become surprised about how much innovation can occur. Therefore, a relevant research theme is the role of IC in performing relations between the past and the future of the objects that it helps influence. Rather than asking whether IC performs an information or a control system (as others do) or predicts types of innovation profiles (as yet others do), we ask how IC helps perform innovation as a process of becoming.

There are two main reasons for this research question.

The first is that IC research may be directed to the performativity, not of itself, as in stabilising an IC system, but of the firm towards a future. Other performative research on IC has focused on and analysed how people come to terms with the ambiguities and the fluidity of IC and make it a resource for decision-making (Arnaboldi et al., 2017; Rooney & Dumay, 2016). This focuses on the stabilisation of decisions, but it does not take into account the multiple outcomes produced in complex knowledge-based processes. Therefore, it is useful to consider how IC helps drive effects in the world. The aim is to move IC from a study of its ability to bend

around decisions to the study of its broader organisational and social consequences on the knowledge economy, such as the relation to innovation.

Second, the research question is interesting for the formation of the knowledge economy in the sense that is parallel to what previous quantitative IC research has addressed. The relation between IC and value as innovation and financial capital is underscored by seminal research, which shows that depending on the ways that the 'components' of IC—often summarised as human, organisational and relational or social capital—are related, innovation may turn out as incremental or radical (Hsu & Fang, 2009; Leitner, 2011; Subramaniam & Youndt, 2005; Youndt et al., 2004). Much research has since then been directed towards exploring this thesis in various situations and countries (e.g., Buenechea-Elberdin, 2017), and it is possible to state with some confidence that increasing levels of innovation do seem to be related to increasing amounts of IC. However, this stream of research is interested in how much innovation is related to IC and omits questions about how innovation is composed in relation to IC. The ostensive 'how much' projects the effects on a one-dimensional scale, while the performative 'how' is concerned with the multiplicity of possibilities and the fluidity of IC categories and their relations (Abhayawansa et al., 2018; Guthrie et al., 2012; Mouritsen, 2006; Rooney & Dumay, 2016; Zambon et al., 2019).

Instead, in our paper, by responding to the need of much critical theoretical work on IC accounting (Alcaniz et al., 2011; Roslender & Fincham, 2001), we link the ostensive and positive approach's focus on effects, with their normative and policy-oriented emphases, to the extant, more critical, performative approach's focus on fluidity. We consider the performative effects of IC in relation to innovation by mobilising the notion of performativity that relies on movement, emulation and transformation of innovation through drawing on and reconceptualising IC. Drawing on Butler's (1993, 1997, 2010) analyses of *perlocutionary* performativity the study underscores that performativity can go in different and highly unpredictable directions (Callon, 2007; D'Adderio, et al., 2019); it is not a destination but an ongoing journey (Garud & Gehman, 2019), which helps us describe how IC signs, numbers, texts and pictures become what Butler calls citations, that is not just neutral or objective references but signs that can move around, occupy new spaces and become ex-citations that can produce novelty. When relating IC and innovation, we focus on the things that are already in motion. We propose that in this situation, IC helps perform (through citation and ex-citation) what we call bushy innovation patterns, much of which is surprising and composing a process of capitalisation of knowledge. This claim is based on our analysis of the development of a firm's engagement in IC over two decades.

2 Theoretical resources

2.1 Literature linkages: the operation of IC and its innovation effects

Innovation is a successful attempt at improving or creating a product, process or business model. It is based on the application of knowledge, either through human

imagination (Drucker, 1984, 1991, 1993; Kreiner, 1999; Nonaka & Ikujiro, 1995), the production and constellation of information (Latour, 1987; Lev et al., 2009; Mouritsen & Koleva, 2004) or through collaborative, knowledge-sharing arrangements with customers, suppliers and even competitors (Beattie & Smith, 2013; Håkansson & Lind, 2004; Mouritsen & Thrane, 2006). Innovation is an outcome found in practices when products and processes embody knowledge and IC, which indicate their *transformation* into new matter (Drucker, 1991; Kreiner & Tryggestad, 2002).

IC research has addressed this point. A sizeable body of good statistical work has modelled this relation in different ways and achieved a level of confidence to conclude that indeed, IC is a precursor of innovation and beyond financial capital (Buenechea-Elberdin, 2017). This general relation between IC and innovation holds well, and there are different ways in which IC elements can moderate and mediate one another and create profiles of the relations between IC and innovation, for example, whether the outcome is incremental or radical innovation (Buenechea-Elberdin et al., 2018; Leitner, 2011; Subramaniam & Youndt, 2005; Youndt et al., 2004). The research is wanting in some sense by its own standards since large firms are overrepresented, high-tech firms appear to be prioritised, and European, US and Asian firms are represented relatively more. Nonetheless, there is support for this model to work under many different conditions, as Buenechea-Elberdin's (2017) survey shows.

This research captures profiles of IC in relation to types of outcomes, such as radical versus incremental innovation (Youndt et al., 2004). Such IC profiles provide structural understandings of the operation of IC in different kinds of situations. However, it does not seek to unravel the managerial, strategic or political mediations that help mobilise IC towards some ends. While the cross-sectional statistical research is likely representative, it represents firms rather than practices and involvements. In particular, it is silent on the particular moves that make IC a resource. This has been discovered by research that prefers the performative rather than the ostensive approach to understanding IC (Mouritsen, 2006). This approach takes issue with the ostensive literature's claim that the categories of IC (human, organisational and relational capital) are stable entities and their relations are causal. Sometimes, these relations are fluid (Catasus & Gröjer, 2006; Catasus et al., 2007; Murthy & Mouritsen, 2011); at other times, the categories are fluid (Abhayawansa et al., 2018; Rooney & Dumay, 2016). Often, relations and categories do not speak for themselves but need narratives to stabilise them and to develop connections in relation to some purpose or decision opportunity.

Extant performative research in IC has focused on sorting out the ambiguities of IC categories by reducing such ambiguities through narratives. Rooney and Dumay (2016) have introduced the mechanism of qualculation, where calculation and judgement coalesce, and Abhayawansa et al. (2018) emphasise the role of interpretation. Qualculation and interpretation make decisions more coherent, and by these mechanisms, ambiguous information about IC is aligned with a decision. In this way, qualculation and interpretation develop stability in categories that are otherwise fluid and ambiguous. This approach is concerned with how people mediate and master IC. This performative research has developed attention to the fluidity of the operation of IC. By developing 'critical' or detailed fieldwork (Dumay & Garanina, 2013;

Yu & Humphreys, 2013; Wasiluk, 2013), such research attempts to show how IC categories have fuzzy boundaries (Giuliani & Skoog, 2020)– how they can swap roles in an IC proposition, sometimes being an input and at other times an output (Murthy & Mouritsen, 2011). It has also shown that users draw implications of IC only in contingent ways and in specific time frames; therefore, they develop singular appreciations of the character and the value of IC which evolve over time (Giuliani & Skoog, 2020).

The ostensive approach assumes that IC categories are stable and can be led to effects such as innovation directly. In contrast, the extant version of the performative approach assumes that IC categories are fluid but can be domesticated and made stable in relation to a decision. However, attention to the effects of the decision on other things (e.g., innovation) is absent. Therefore, a lacuna exists in current research; the extant ostensive research is concerned with effects, while the extant performative research is concerned with (potential) decisions and interventions. Our aim is to tie these concerns together and consider how IC may be involved in the performativity of innovation—how a performative approach may produce multiple outcomes on things other than the IC system. To accomplish this, we draw on perlocutionary performativity.

2.2 Perlocutionary performativity

IC retains a dimension of surprise and uncertainty about possible outcomes if we follow Leif Edvinsson (see opening quotation). To him, IC is not about the certainty of the future but on its possibilities—instead, it is a melody with improvisations. Therefore, IC is not a set of generalised predictions because even if this is what ostensive research states, as this is too general and only recognises few outputs (incremental and radical innovation) and a limited set of styles, all of which are grand generalisations, perhaps too grand for understanding practice. Instead, the movement between the past and the present engages IC, and the generalisations do not exhaust what IC can have. IC may be understood as helping build points of intervention in an ongoing process of becoming. This is the interesting implication developed from perlocutionary performativity.

In the essay "Performative Agency", Butler writes:

> If illocutions produce realities, perlocutions depend upon them to be successful. Whereas illocutionary performatives produce ontological effects (bringing something into 'being'), perlocutionary performatives alter an ongoing situation. In this sense, the illocution appears more clearly to rely on a certain sovereign power of speech to bring into being what it declares, but a perlocution depends on an external reality and, hence, operates on the condition of non-sovereign power. (2010, p. 151)

Performativity, has two faces. One is illocutionary and can be demanded by a sovereign (as IC citations can as they are part of a firm's infrastructure). Another is perlocutionary and about the multiplicities in the situation that an action can tie in with and thus become different. Perlocutionary performativity does not have one

sovereign actor and therefore, the effect of using IC in situations with unknown participants and ideas evolves and emerges in innovation action. Paralleling Edvinsson's inclinations, perlocutionary performativity involves tinkering with an ongoing situation that is settled neither on a clear starting point not ending point. It engages with existing realities and transforms them by being enacted again. Perlocutionary performativity does not emerge out of nothing. Ostensive research on IC starts from a sovereign investment in IC categories and predicts general effects. In contrast, perlocutionary performativity separates and joins what is already under way. The process of separating and joining implies that reality is fluid and is the effect of many different agencies. In such a process, little attention is paid to the powerful strikes of the sovereign but only to a history of action and repetition that in each enactment changes and re-composes this historical reality, which is 'in some ways out of our control' (Butler, 1997, p. 15). Therefore, the possibilities of failure and surprise are intrinsic to and constitutive of the reality.

Citations can travel into unforeseen contexts and be recited in unexpected ways. In the citational process, there is always the possibility of a slip of meaning and, hence, an opening for the unexpected, subversive re-signification of what the cited terms should realise. To Butler, language is always constituted by citable signs that are disengaged from the original intention of the speaker or writer. These signs circulate because of their citeability, and through this circulation, they become excitable which is the force that reissues, reinvigorates and changes things while the original intention loses relevance.

This is where Edvinsson's proposition becomes interesting. What happens when IC becomes a set of citations that can be transformed and thus ex-cited in the movement of ideas, discourses and surprises in a complex and historically enacted world that moves from the past to the future but is interrupted by improvisations and thus changing the melody? In IC, citations and ex-citations encompass a process of capitalisation as a becoming of innovation. This aspect of Butler's theoretical stance perlocutionary performativity (1993, 1997, 2010)[1] is relevant for IC research because it retains the historicity of forces but is open to changes and surprises as a process of capitalisation. The idea of capitalisation pays tribute to one of the most powerful pictures of IC, which has been presented in literature and is the metaphor of the tree by Edvinsson and Malone (1997). In order to assess the value of the tree, the wise investor does not look at only the 'ripe fruit', but he/she considers the roots under the surface. Mouritsen et al., (2001a: 361–362) commented on this metaphor by observing that this is '*a story about the relationship between the past and the future, and... [these] interlinked activities... happen all over the tree at any moment in time. To understand a firm's intellectual resources, one has to look beyond the present fruits and towards the ability to produce fruits in the future*.'

[1] This view of performativity differs from Michel Callon's (1998) version of performativity that has been used in accounting and finance studies. In Callon's usage, performativity refers to the ability of economic theories, models and technologies to (re)make economic realities in their own image (Callon, 1998, 2007; see also MacKenzie, 2003, 2007; MacKenzie & Millo, 2003). This is a movement from theory to its realisation.

3 Methodology

The empirical setting for this study is Autostrade, a global leader in the management of transportation infrastructures. The group's operations spread through 10 countries and involve about 14,000 km of motorways and the management of three airports. As it will be explained further in the empirical section, the characteristics of this highly capitalized and knowledge intensive organization make Autostrade an ideal field-work location for a study of the intellectual capital.

In this research we followed the trajectories of IC, through which knowledge, meanings and ambitions were capitalized, and considered their performative effects on innovation which changed the boundary of the firm by creating a new organizational reality. This paper draws upon empirical interactions with the field and on a set of primary and secondary archival sources (i.e., *Sustainability Report*s, *Annual Reports*, *Integrated Reports*, *Environment and Social Reports, Quality Reports*, traffic studies, etc.) covering two decades (from 2002 to 2022). A detailed list of all the documents taken into account for this study, the specific years and related content is shown in Table 1 in *Appendix*.

The longitudinal study design (Carnegie & Napier, 1996) appeared the more promising for the purpose of this research. This because this extended time horizon allows us to investigate the performative role of IC citations in enacting innovation and bringing forward different pathways to value.

IC works in broad temporal windows (building, develop and apply knowledge and competencies requires time) as Edvinsson indicates. Innovation is an effect that materialises over time and will not typically be realised as an event in one year that can be related to a financial effect in only that one year. There is, for example, a temporal movement between idea, patent, product proposal, development of production systems and service arrangements and subsequent potential financial gains spread over years (Lev, 2001).

In order to making sense of the interactions between IC citations and innovation we adopted and performed a qualitative content analysis on the accounting reports (Hoque et al., 2017, p. 524). Others have also relied on sustainability reports and integrated reports to discover IC (Cinquini et al., 2012; de Villiers & Sharma, 2020; Feng et al., 2017; Oliveira et al., 2010; Pedrini, 2007).

Accounting reports are interesting spaces of inquiry because they present the achievements of the year through narratives, quantitative financial and non-financial indicators, and visual representations. We explored each report by searching for the interactions between citations related to IC and narratives about innovation. We then reconstructed the evolution of IC citations, new related initiatives, and innovation paths over the period under consideration. Finally, we created a graph (see Fig. 6 in the next section) to illustrate the movements in terms of the effects on knowledge that were produced.

Other content-based research about IC is typically interested in the *amount* of IC in reports (Beattie & Thomson, 2007; Guthrie et al., 2004; Parshakov & Shakina, 2020; Striukova et al., 2008). We focus on the emerging and dynamic relations between IC and innovation. This temporality is important, given our

perlocutionary approach to performativity, where our concern is not the amount of IC but how IC helps perform innovation through temporal processes.

We searched for innovations (related to ex-citations, to follow Butler, 1993, 1997, 2010). Innovations develop a trajectory over time, and each is followed by different ones. An innovation opens for others. Innovations are cited by later efforts and come up with excitations in the form of new innovations. They produce new citations that open to more innovations as excitations assemble towards new pieces of innovation. This is the point that makes innovation a bushy path from the past to the future. It is bushy because capitalising involves the production of several trajectories around technology, markets, globalisation and even failures.

In analysing such documents and the related data, we have classified under the umbrella IC all propositions, numbers and pictures related to the investments in knowledge resources, while we have organized in the space of innovation all the new effects produced in terms of process improvements, product development, new business models adopted, new market spaces or initiatives oriented to strengthen or expand the relationships with users even in new business. In the next section we provide some examples of how, drawing from the accounting reports, we have reconstructed the dynamics between IC citations and the innovation paths.

4 Empirical findings: the performativity of IC and the bushy form of capitalisation of innovation

Autostrade is a motorway licensee, which was founded in the beginning of the 1950s by *Istituto per la Ricostruzione Industriale* (IRI, in English, Institute for Industrial Reconstruction), with the aim of contributing to the post-war reconstruction of Italy by building, managing and upgrading the motorway infrastructures. In one of the early integrated reports, the company is depicted as follows:

> 'Autostrade is a group of companies made up of people working together to plan, build, expand and manage a motorway network of benefit to the social and economic development of the country and to ensure a fluid and safe mobility' (Autostrade's Integrated Report, 2005, p. 92).

Established as a construction company, over the years, Autostrade has developed knowledge about toll payment and traffic monitoring systems. This IC has moved the company's strategy towards new spaces, involving new service and financial activities, new geographical markets and even new types of core activities. Currently, Autostrade is a global leader in the sector of motorway and airport infrastructures and services related to mobility. The group, with a current presence in 25 countries, manages 14,000 kms of toll motorways, the airports of Fiumicino and Ciampino in Italy and the airports of Nice Côte d'Azur, Cannes-Mandelieu and Saint Tropez in France.

In the last published annual report, it is possible to realize how the boundaries of the firm expanded over the last two decades:

> Autostrade per l'Italia is today an integrated group focusing on engineering and construction through the subsidiaries, Pavimental and Tecné, sustainable mobility, technological innovation and advanced digital services for motorway and urban transport systems following the launch of Movyon (the new name for Autostrade Tech from February 2022) and *Free To X* and, with the establishment of Elgea at the beginning of 2022, the production of renewable energy. (Autostrade Annual Report, 2021; p. 24)

From this quotation, it is possible to understand how Autostrade is moving towards an increasingly integrated mobility management model which includes also urban mobility and the production and sale of energy from renewable sources. Elgea-Space for Energy is the new company dedicated to the production of green energy exploiting the areas along and around the motorway network for the installation of photovoltaic panels. Elgea will help ensure the green energy to supply charging stations for electric vehicles.

Knowledge has capitalized in different directions, over the last two decades, and Autostrade has spent considerable effort to publish supplementary reports in order to present its activities beyond the financial outcomes. The empirical case documents an abundance of IC citations from calculative, narrative and visual references and shows how IC is part of the process of capitalization of knowledge, meanings, wanting and relationships. This process can be theorised as performative. Figure 6, in the last part of this section, illustrates the bushy character of this process of capitalization of knowledge by a spiral whose origin is building motorways from where new destinations evolve.

In this empirical section, we analyse the performativity of IC as citing and ex-citing knowledge resources. Citations related to the abundance of calculative, narrative and visual signs link knowledge to its effects. Autostrade's reports, revolved around the use value of a fast, safe and fluid motorway mobility. Citations of safety, accessibility and fluidity helped ex-cite the capitalisation process, which developed innovations.

4.1 IC citations and the articulation of use value

The IC accounting system in Autostrade's reports was not primarily organised around generalising terms, such as human, organisational and relational capital, which are often understood as the containers of IC (Guthrie et al., 2004, 2012). It was structured around citations of what Autostrade's object of concern—the motorway—did for users. Autostrade's reports followed the idea that knowledge and capability are wrapped in products and processes (Drucker, 1984; Kreiner & Tryggestad, 2002; Lev, 2001). Therefore, rather than counting the size of human, organisational and relational capital, Autostrade's reports focussed on what knowledge could do for users of its services. This is a form of usefulness—use value rather than financial value—that performs the IC knowledge narrative by numbering, narrating and visualising pathways of knowledge enactment. For example, the use value to realise safe and fluid mobility was presented as numerical citations in Fig. 1. These citations concern the 'global accident rate', the 'death rate'; the 'IPAV' (road-holding and road surface evenness) and the

SERVICE	QUALITY PROVIDED	2009	2010	2011
SAFETY	Global accident rate	36.48	36.51	34.55
	Motorway accident rate	30.67	30.89	28.83
	Casualty accident rate	10.43	10.02	9.29
	Fatal accident rate	0.30	0.32	0.26
	Death rate	0.32	0.33	0.29
	Horizontal road markings indicator: ISEGN - Range 1:100	78.93	74.58	75.82
FLUIDITY	Traffic flow index: Total Delay (total hours lost due to congestion)	5,337,759	5,399,128	4,552,225
	Total duration of tailback and delays (hours):	31,898	35,370	30,491
	- of which due to works	2,439	3,226	2,005
	- of which due to accidents	5,027	5,025	4,655
	Total hours of traffic stops:	507	467	419
	- of which with duration > 1 hour	293	244	232
	% Telepass transactions out of total	57.2	58.3	58.9
	% unpaid transits out of total traffic on exit	0.37	0.36	0.37
	Average waiting time between request and operator response (sec.)	11.6	11.6	11.5
TRAVEL INFORMATION	Variable message panels along road	523	528	548
	% of traffic covered by the service	99	99	99
	% of toll stations with VMPs on entry	96	96.5	97
	% of traffic covered by service on entry	98	98	98.5
CUSTOMER RELATIONS	% of calls handled by Commercial Call Centre	98.4	97.5	97.3
	% of calls handled by Traffic Call Centre	99.1	99.6	99.8
	% of calls handled by billing and credit recovery Call Centre	99.5	99.4	99.5
	Average response time for total ASpI complaints - Letters & fax (days)	7.7	9.9	7.5
	Average response time for total ASpI complaints - E-mail (days)	3.4	3.6	6.4
SERVICE AREAS	% of surveys for service areas within standards	98.9	98.5	98.5

Fig. 1 Intellectual capital citations—Autostrade's Quality Report published in the Sustainability Report (2011, p. 95)

'number of horizontal road markings'. Traffic fluidity cites the hours lost in traffic congestion, using a Total Delay (TD) index.

These are all citations that monitor the realization of the ambition for use value in achieving safe and fluid mobility. However, there are often contradictions among these elements. For instance, a reduction in the 'global accident rate' or the 'death rate' could potentially be achieved in conditions of less fluid mobility, which effectively slows down vehicle speeds—a significant cause of accidents. On the other hand, an increase in indicators related to "travel information" supports both safety and fluidity. Informed mobility empowers motorists to choose timing for commencing or concluding a journey, or even opt for alternative routes to their destination.

Figure 1 also presents additional IC information, of a more relational kind, concerning users' satisfaction and the quality of service areas situated along the motorway. While these indicators are not directly tied to the use value of realizing safe and fluid mobility, they serve as the litmus test for ensuring that all operations are proceeding well.

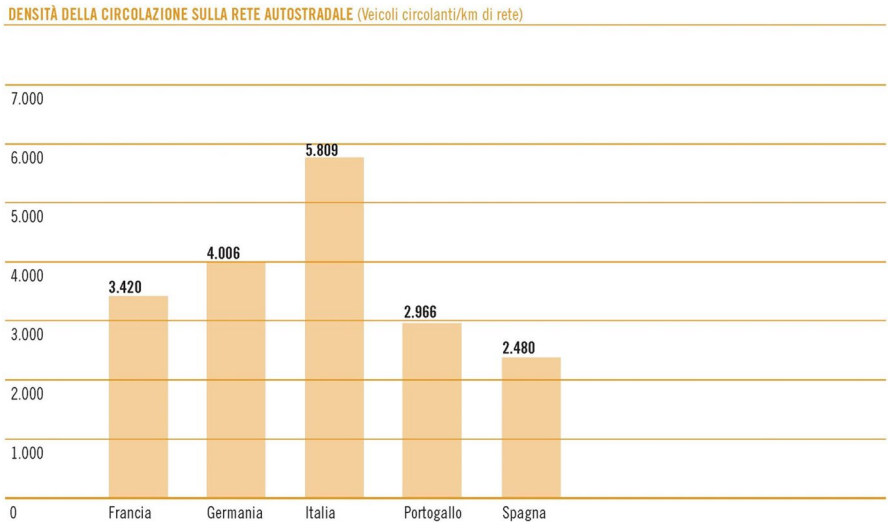

Fig. 2 IC citations—Graphs—Traffic calculations: traffic density in relation to the length in km of the motorway network (number of vehicles/km on the motorway network). (Autostrade Annual Report 2003, p. 42). This is a comparative analysis among five European countries (France, Germany, Italy, Portugal, Spain).

4.2 Linking IC to innovation

The narrative developed around the idea of safe and fluid mobility, together with calculations about traffic, time lost in queues at tollbooths, traffic density, and the ratios between kilometres of the motorway network and the population, were citations for the development of innovation. One example of traffic calculations is shown in Fig. 2. Its histograms propose that the average density of circulation per kilometre on the Italian motorway network was much higher than in other European countries. It also proposes that when normalising the size in kilometres of the motorway network with the size of the population (expressed in millions), Italy was then a country in need of intervention (see Fig. 3). The references of statistics on traffic were detailed for each motorway tract, as represented in Fig. 4, and for the different months of the year, as shown in Fig. 5.

To combat the problems of traffic congestion, it would have been possible to invest more in tollbooths, but this was not the preferred strategy due to environmental, political, financial and bureaucratic constraints. Instead, a technology, Telepass, was designed to make it possible to move through tollbooths without stopping. It substituted for tollbooth workers and arguably gave users a sense of freedom. Yet, it also made it possible to monitor drivers since it recorded the time of the transit from entry to exit, making it possible to obtain information on the time taken to travel a certain section of the motorway.

Telepass helped to develop IC citations—typically as structural and relational capital—that created knowledge about users. Therefore, it developed citations that became excitable. Telepass and the calculations on motorway transits it

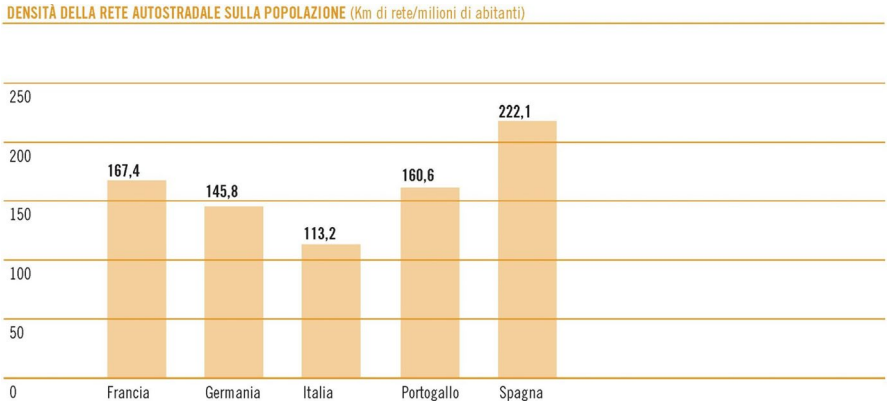

Fig. 3 IC citations—Graphs—Population-adjusted motorway network density (Kilometres of network per million inhabitants). (Autostrade Annual Report 2003, p. 42) This is a comparative analysis among five European countries (France, Germany, Italy, Portugal, Spain)

TRAFFIC ON THE AUTOSTRADE GROUP'S NETWORK (million km travelled)

Motorway	Vehicles*km (million)				ATVD (b) 2006
	Light vehicles	heavy vehicles	Total vehicles	% change on 2005	
A1 Milan-Naples	13,575	4,762	18,337	3.6	62,524
A4 Milan-Brescia	2,598	878	3,476	-1.0	101,858
A7 Serravalle-Brescia	503	129	632	1.7	34,630
A8/A9 Milan-Lakes	2,004	373	2,376	5.2	83,794
A8/26 Trunk road	438	87	525	2.6	59,939
A10 Genoa-Savona	763	170	934	1.8	56,218
A11 Florence-Coast	1,322	286	1,608	3.3	53,918
A12 Genoa-Sestri	791	154	945	1.4	53,163
A12 Rome-Civitavecchia	607	111	718	3.5	30,083
A13 Bologna-Padua	1,441	551	1,992	3.7	42,865
A14 Bologna-Taranto	7,924	2,824	10,748	3.0	37,686
A16 Naples-Canosa	1,210	296	1,505	3.3	23,939
A23 Udine-Tarvisio	472	236	708	3.5	19,161
A26 Genoa Voltri- Gravellona Toce	1,665	480	2,145	2.8	23,993
A27 Venice-Belluno	539	111	650	3.8	21,657
A30 Caserta-Salerno	616	199	815	7.8	40,359
Mestre interchange	72	28	101	4.0	-
TOTAL AUTOSTRADE PER L'ITALIA	36,541	11,673	48,214	3.1	46,274
Turin-Savona	776	173	949	4.2	19,858
Naples-Pompeii-Salerno (SAM)	1,397	165	1,562	2.9	82,906
Naples ring road	966	87	1,053	1.4	142,873
Mont Blanc Tunnel	7	4	11	3.6	5,076
Livorno-Rosignano	200	48	248	2.4	18,590
Valle d'Aosta Motorway Link Road	65	24	89	1.5	9,011
Strada dei Parchi	1,820	312	2,132	3.8	21,225
TOTAL SUBSIDIARIES	5,230	814	6,043	3.1	30,254
TOTAL AUTOSTRADE GROUP	41,771	12,487	54,258	3.1	43,697

(b) ATVD = total km travelled/length of section /no. of days in year

Fig. 4 IC citations—Traffic statistics—traffic details for each motorway tract (Autostrade Annual Report 2006, p. 60)

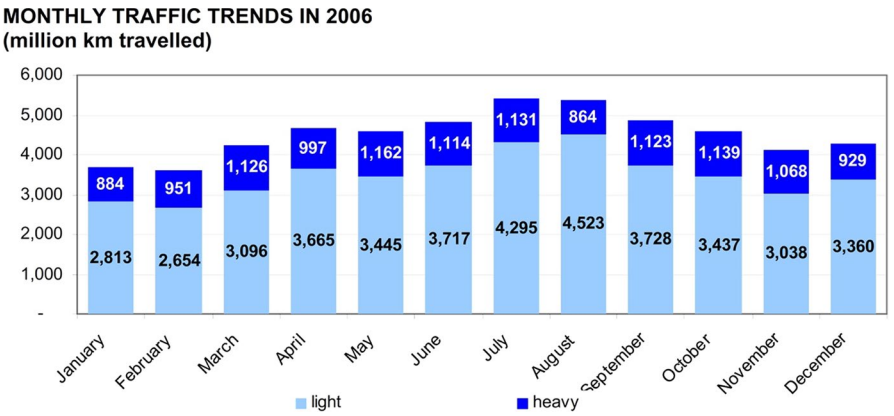

Fig. 5 IC citations—Traffic statistics—traffic details for the different months of the year (Autostrade Annual Report 2006, p. 60)

produced was the driver of further innovations. It became an input in energising innovation by contributing to develop IT technologies, such as the "Safety Tutor" for controlling speed violations over long distances; or info mobility systems for giving users real time traffic information on the motorway network.

Continuing to reconstructing the dynamics of IC citations, the related initiatives and the innovation paths, further analysis of the accounting reports confirms how IC citations were strictly connected to investments in the use value attributes of safety and fluidity which were even nurtured and reinforced through the development of information systems:

> *"The design, construction and operation of a motorway for truck and car traffic also means improving safety and quality of services offered to customers and to reduce the impact on the adjacent environment. Group investment is, consequently, not limited to the upgrading and modernization of the network but also the development of methods to: • improve safety and traffic flows by innovative and technologically advanced systems; • develop information systems to support the improvement of network operations; "(2007 annual report, p. 72)*

Numerical citations related to such investments reveal that:

> *"Total capital expenditure and costs incurred for innovation, research and development in 2007, were €5.1 million… That amount includes total payments for research and development capital expenditure and operating costs." (2007 annual report, p. 73)*

These citations related to investments in innovation and R&D, as highlighted in the below proposition from the 2008 annual report, were oriented to the development

and diffusion of the "Safety Tutor" system, the innovation which employs cutting-edge technology to monitor and enforce speed limits along the motorway network. Through a network of strategically placed cameras and sensors, the system tracks vehicle speeds and compares them to established speed limits to positively influence driving behaviours and enhance road safety:

> *"During 2008, a number of Research and Development projects launched in 2007, after an initial study phase and subsequent pilot trials, went into production: the "Safety Tutor" system, which forms part of the plan to improve speed controls, covers 1,500 km of Autostrade per l'Italia's network at the end of 2008 and 1,764 km of the Group's network (26%). (2008 annual report, p. 81)"*

IC is this collective undertaking involving performativity, which is mobilised by a process of capitalization of knowledge, meanings, wanting and relationships. Capitalisation of IC has stimulated further the expansion of fluidity and safety even in new application areas, even outside the motorway (e.g., urban spaces and airports). For example, it has helped envisage solutions to other problems and other possible IT innovations for mobility management, such as controlling access to limited traffic zones in cities (*zone a traffico limitato* [ZTL], i.e., urban areas, ports, logistic centres and car parks). This innovative approach to mobility management, realised by the knowledge about driving patterns extracted from IT, has facilitated new relations among motorway infrastructures, urban roads and parking areas, integrating extra-urban and metropolitan networks, making cities and human settlements safer and more fluid and thus contributing to enhancing the use value of fast and safe mobility in expanded spaces and even new markets.

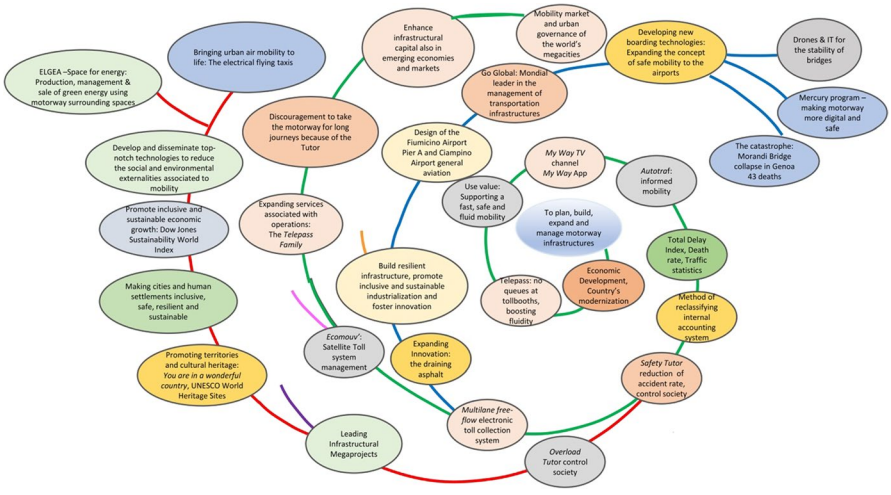

Fig. 6 The bushy process of knowledge capitalisation—the performativity of IC at Autostrade

4.3 The bushy form of innovation

Figure 6 shows the bushy form of the capitalisation of innovation. The figure gathers ex-citations of innovation, but those are not necessarily separated things. Connections are not perfect; there are contradictions between the elements of the use value; things have come to a halt as some branches have stopped development. The bushy form shows that performativity does not necessarily mean success (as this would be illocutionary performativity); rather, there would be tensions because some situations would misfire. Performativity could turn on itself and fail.

Figure 6 illustrates innovation as a continuity and a transformation of a capitalisation process. The spiral, a line that wraps itself in and makes revolutions around itself, has its origin in building motorways, but from there, through citable and excitable movements, new destinations have evolved; new enactments, extensions and transformations have been mobilised.

This bushy process has been produced by the 'historicity of forces' (to plan, build, expand and manage motorways in order to support fast, safe and fluid mobility—the central blue circle in the ellipsis). It has opened towards an indeterminable and unsaturable future (moving from the earth to the sky, expanding the concept of fast, safe and fluid mobility from the motorway to the airports and air traffic—the upright yellow circle in the figure—and to the urban air mobility with the flying taxis). This movement, the evolution of a force that unfolds its paths, has provoked—in its continuity, both creation and destruction. This is perlocutionary performativity, where one settlement is moved into new ones when a new insight ex-cites the development of new traces and new technologies for operating things.

Figure 6 sums up a capitalisation process where knowledge has produced effects that in turn become generators of other effects. Each element in the spiral has moved towards new destinations through ex-citations rather than through preset causal mechanisms. Each has made a difference and has functioned as an elliptical, punctualised step in a process of capitalisation. Such a process has made manifest and prolonged a movement, which has developed from the use value of safe, fluid and fast motorway mobility, and has expanded itself from this historicity of forces into new spaces. Figure 6 illustrates that from the original mission of building roads developed around the narrative of safe and fluid mobility, moving through the concept of informed mobility, Autostrade's reports have come to extend the idea of safe and well-informed mobility to airport and urban traffic. A possible future is the management of the mobility market and the urban governance of the world's megacities, as the company was already doing in Santiago de Chile.[2] In a capitalisation process, every element joins what is already underway, and from that, it finds the levers to go further (Butler, 1997, 2010). For example, Autostrade has exported its know-how to other countries, such as Austria, France, Brazil, Chile, Poland and the US.

Some spirals have faced interruptions due to unexpected events or because some initiatives have been abandoned due to the impossibility of exploiting the connected knowledge. For example, this was the case of the Tower and Co. project that aspired

[2] Italian newspaper *Repubblica*, December 11, 2018.

to valorise the infrastructures and the areas of the grounds present on the group's network sites, which were designed to host the antenna and the equipment (the so-called towers) used for telecommunication and traffic monitoring systems. The idea was to rent these towers to the telephone operators (TIM, Vodafone and Wind) and possibly enter the telephone business, but this project failed, and the towers were used for institutional needs only.

Via the bushy form, Fig. 6 indicates that innovation has no single stable destination but moves in different ways and interdependencies exist among the different movements, as one innovation catalyses others into new spaces and directions.

Every innovation could accelerate or detract from the capitalisation process. For example, the Safety Tutor has enhanced safety, the company's reputation and police intervention, but it has also reduced fast mobility and sometimes discouraged users from using the motorway for long-distance travel. The Safety Tutor has been intended to teach motorists to drive slowly, but this has contradicted other parts of the use value. If the Safety Tutor has increased safety, it has also reduced the appeal of the motorway as a speedy (accessible) way of transportation. Therefore, there has been a trade-off between the value of speed (competing with speed trains and airplanes for long journeys) and the value of safety and control promoted by the Safety Tutor. As a process of becoming, capitalisation could move in different directions. Sometimes, it has accelerated; at other times, it has slowed down or even detracted from the capitalisation process.

4.4 The catastrophe: the collapse of Genoa's Morandi Bridge

Possible actions, or absence of actions, could run against safety. The terrible catastrophe of the collapse of Genoa's Morandi Bridge is an example of how the parameters denoting safety are complex and multiple. They are linked not only to the reduction of speed and the accident rate and to the surface of self-draining asphalt but also to the knowledge of repair and maintenance of the physical infrastructures (like bridges) that can be ambiguous and misfire.

It was 11:36 on August 14, 2018, when the city of Genoa in northwest Italy was awakened by a strong summer storm, and a section of the Morandi bridge that spanned the industrial and river area of Sampierdarena, stretching 250 m, suddenly collapsed along with supporting pier number 9. The shocking images of the Morandi bridge's collapse will remain etched in memory.

The tragedy claimed the lives of 43 people, including those aboard vehicles crossing the bridge and workers on the lower platform of the AMIU ecological island, the municipal waste collection company. This is a story of intellectual capital (IC) destruction not only for Autostrade but even for the entire nation. As noted by one of the prominent foreign news outlets, The Guardian, the tragedy "also delivered a significant blow to Italy's once-proud engineering legacy and the country's confidence in its expertise in a crucial construction technology: concrete."

The bridge collapse led to the closure of the highway connection between A7 and A10, along with numerous roads below it, as well as the railway line connecting to the

port. Additionally, 566 residents living beneath pier number 10 were evacuated as a precaution. On August 15, the Council of Ministers declared a state of emergency in the municipality of Genoa for a duration of twelve months. The judiciary initiated a series of investigations to ascertain potential responsibilities of Autostrade and other entities involved to varying degrees in the administration and maintenance of the motorway infrastructure.

A total of 59 defendants are still facing charges of manslaughter, negligence, forgery, and various other offenses related to the deaths of 43 individuals. Among them are former executives and experts from Autostrade, as well as former officials within the Italian Ministry of Infrastructure and Transport. Disputes and controversies emerged in the discourse. While prosecutors alleged that the defendants were aware of the bridge's collapse risk and neglected maintenance to cut costs, a lawyer for former Autostrade CEO Giovanni Castellucci argued that the collapse was due to a sudden 'construction defect' rather than maintenance negligence.

The scale and severity of the events prompted the government to consider a comprehensive review of the state's concession system, even considering the revocation, dissolution, or withdrawal of the concession from Autostrade. In 2021, the company Autostrade came under state control.

From the ashes of intellectual capital destruction, the phoenix rose, suggesting new rebirth solutions, despite the enduring irreparable tragedy of the loss of 43 lives. The remnants of the bridge were demolished, and a new viaduct, designed by architect Renzo Piano, was inaugurated in August 2020 to take its place. The architect, renowned for landmarks such as the Shard in London and the Pompidou in Paris, hails from Genoa. He conceived the new bridge as a gift to the city.

Such a disastrous event could revamp the capitalisation process radically. This story shows the surprises and the frailties in a capitalisation process. Inaccurate behaviours and unintended consequences could end in disasters (as in the case of Morandi Bridge). The bushy form could revert, become negative or become contradictory; innovations could misfire and backfire through capitalisation.

Moving from past mistakes and looking to the future, the use of drones and IT technologies to calculate and control the stability of bridges, viaducts and tunnels has recently been another layer to develop IC—not only in Italy, but even in other geographical markets where the company has expanded its influence. Recent initiatives have been addressed towards the Mercury program (see the up-right side of Fig. 6), a technological innovation programme lunched in the early 2022, "that will contribute to the transformation of the motorway infrastructure, making it more digital, sustainable and safe" (2022 Sustainability Report, p. 6). Exploiting the capillarity of the motorway network to enter the market for the production of green energy through the installation of photovoltaic panels in the areas adjacent to the motorway is another challenge that ELGEA, the newco of the group, is embracing (see the up left side of Fig. 6). Capitalisation went on and gave the firm new strategic properties.

5 Performing IC and the development of innovation

In this section, we discuss the relation between IC and innovation through the lens of performativity. First, we argue that IC is related to innovation in a bushy form rather than a direct one, which is predominant in the ostensive literature. Second, we argue that IC develops attention through durable IC numbers that drive a narrative rather than the narrative making stable the fleeting and ambiguous IC numbers, which is the position of extant research (Abhayawansa et al., 2018; Mouritsen & Larsen, 2005; Rooney & Dumay, 2016) about the performativity of IC.

5.1 IC and the bushy character of innovation

In proposing that IC is related to a bushy account of innovation, the case of Autostrade's reports illustrates how items of innovation in various areas, including IT, material technology, market expansion and globalisation, develop together over long periods of time. This is a bushy development since it consists of heterogeneous elements and a time horizon that is never finished. One item of innovation mingles with other types over time and across space, and together, they perform the future. This corroborates the general point in IC research that IC is related to knowledge and innovation.

However, compared with extant literature, this case shows a dynamic aspect that is typically absent. Extant literature focuses on establishing stable links between IC categories and abstract innovation strategies via a causal model of accumulation of IC (Carmona-Lavado et al., 2013; Chen et al., 2006; Delgado-Verde et al. 2011; Elsetouhi et al., 2015; Hsieh & Tsai, 2007; Hsu & Fang, 2009; Leitner, 2011; Martın-de Castro et al., 2013; Shiu, 2006; Subramaniam & Youndt, 2005; Wu et al., 2007, 2008; Zerenler et al., 2008). This has the advantage of creating oversight, but it misses the effectuation *mechanisms* that are part of a capitalisation process that would make innovation a likely outcome of IC.

The case of Autostrade's reports shows how IC, by pushing innovation, develops innovation in a bushy rather than a linear fashion. As illustrated in Fig. 6, innovation is difficult because it requires pursuing many avenues, not all of which will succeed. This development cannot be said to have a discernible start or a particularly clear ending. Each intervention, each item of innovation, enters a world that is already in progress and is transformed to some extent by the additions made by innovations. This means that innovation is broadly in progress and in a sense, cannot be evaluated because more will come. This differs from the assumption in extant literature that it is possible to find a time when IC can logically be related to outcomes, either strategic or financial. In a sense, such outcomes, even if stabilised by statistical methods in extant research, cannot be captured as they are always on the way to somewhere else. This may explain why statistical work in IC–innovation relations are often based on questionnaires about people's sentiments regarding IC categories rather than the citations and the ex-citations produced in reports. IC–innovation relations have a temporality that differs from that of the financial valuation that they

may be associated with; a particular item of innovation may live on for a long time in many different revenue streams.

The bushy character of IC–innovation trajectories illustrates that value creation is heterogeneous and may even have counter-productive effects, such as things (e.g., bridges) falling apart. The part of extant research that correlates measures of IC with measures of financial value is helpful yet, it may be limited in understanding how variations of IC–innovation relations develop and how they help produce multiple revenue streams.

For example, Baruch Lev's (2001) Value Chain Scoreboard model promises offering a forward-looking approach to assessing corporate performance by acknowledging the evolving landscape of business and the importance of intangible assets in a comprehensive framework that seeks to evaluate and assess a company's value creation and performance across its entire value chain. However, it looks like a linear model based on seemingly clear cause-effect linkages which accounts for innovation activities. The model shows how R&D and innovation can be considered as forming a long pipeline of things that emerge and transform before it is possible to think about revenue streams. Indeed, Lev focuses more on other matters, such as Intellectual Property and patents, to account for innovation and only later defines the various revenue streams that they may enable.

The bushy character of innovation extends this idea but adds other domains of innovation related not only to technology but also to business models. First, it is impossible to predict with any precision the revenue streams from these. Revenue streams also have to be invented and innovated. Second, and perhaps more importantly, in contrast to the claims of Subramaniam and Youndt (2005), it is not possible to determine whether the bushy character of innovation is radical or incremental. Sometimes, it may be radical, but often, the addition is an increment to something that is already in place. The radical innovation may be an effect of the accumulation of the various smaller or incremental kinds of innovation that occur over a long period of time. Therefore, it may be that the bushy character of innovation is neither incremental nor radical in its activities but may become radical in its overall effects. This is what ex-citation creates—novelty based on continued mobilisation of citations.

5.2 IC as durable citations and stable narratives

Autostrade's reports also make it possible to rethink the role of IC signs, or in the language of perlocutionary performativity, IC citations—those of the indicators that are cited and re-cited. It shows that such citations can lure an expansive innovation agenda into action even if it tends to stabilise certain citations and certain use values. This is a step away from extant IC research's focus on ways in which IC signs can be stabilised by interpretation and intuitions to settle ambiguities (Abhayawansa et al., 2018; Rooney & Dumay, 2016). This research is concerned with individuals' power to master IC elements and make them decision relevant (Corbella et al., 2019; Zambon et al., 2019).

The study of Autostrade's reports moves performativity from a methodological principle—field-based, complex explanations (Guthrie et al., 2012)—to an ontological principle. The IC citations do create durability by being relentlessly reproduced.

It is impossible to escape their commanding power to put things into motion. The citations of use value (accessibility, safety and fluidity) track effects on one side and require people and technology to move into new relations, thus ex-citing the citations durably. The pressure to invest in use value and the materialisations of those investments find themselves in ex-citations that are innovations, and these create a bushy form because innovation feeds and learns (they become citations for later innovations) and makes it possible to make the next one.

Thus, Autostrade's IC model not only endures but also produces fluidity in the form of permutations, differences and novelties because it insists that the investments should be made. Here, not only do people use IC citations but IC citations also 'use' people by providing traces for action. This relation between citations and ex-citations is important for innovation and epitomises a stronger version of performativity that does not come from the discussion about the meaningfulness of the indicators or the solidification and stabilisation of the citations generated by the repetition. This notion of performativity comes from the transformation of citations into ex-citations and therefore relates to new possibilities in the world.

These citations are numerical, as well as value driven. They are numbers that by themselves express and create a narrative. The narrative becomes the effect of such numbers that are linked to outcomes, such as operational use-value effects. While in extant IC literature, the narrative is there to make sense of numbers (Abhayawansa et al., 2018; Mouritsen & Larsen, 2005; Rooney & Dumay, 2016), in the case of Autostrade's reports, it seems that numbers circumscribe the narrative and continue it by its insistence on effects. The citations are not structured by human, organisational or relational capital but by their ability to mobilise a use-value narrative. They are not containers of resources but agents of transformation because they require spending time and money (i.e., energy that provokes ex-citations) on things that are motivated by the knowledge narrative.

6 Conclusion

First, in this paper, we have shown that IC is related to a bushy form of innovation that illustrates Edvinsson's melody from the past to the future more than a structural relation between the amount of IC and the number of types of innovation, which seems to be the extant position in ostensive IC research. Second, we have shown that this dynamic is a performative relation that pays attention to changes in the world of innovation more than the stabilisation of interpretation of information, which seems to be the extant version of performativity. We have shown that a narrative may not be the glue that fits numbers together but the thing that comes out of numbers, or citations, when repeated systematically.

These findings are possibly tightly coupled with the particular case of Autostrade, yet it does open a new, less institutionalised understanding of IC compared with the one that seems to exist currently. It opens the question of what occurs when IC is understood as a flow—as a melody, to quote Edvinsson—rather than a stock or an item being stabilised. When IC citations help enact innovation via ex-citations, not only does the innovation capitalise

and sometimes fail, but it spills over into a broader movement where the firm changes its identity, not only from a construction company to a knowledge-based one but also from a local to a global firm. When interacting with the world, IC citations help draw new boundaries, expand the meanings of such boundaries and even reconfigure arenas of power.

The current literature on IC is about individuals making sense and making a decision and about the ambiguity related to decision making rather than to the effects on the firm (Abhayawansa et al., 2018; Corbella et al., 2019; Rooney & Dumay, 2016; Zambon et al., 2019). Moreover, our paper is less concerned with the challenges and frustrations people experience when accounting does not allow them to attain perfection but only incompleteness (Busco & Quattrone, 2015, 2018a, 2018b; Jordan & Messner, 2012; Mouritsen & Kreiner, 2016; Quattrone, 2017). Instead, our study highlights the broader effects on the firm, which are visible through new reporting systems. While other process-sensitive research has focused on the aspect of performativity that introduces the idea of 'IC in the making' and follows uses of IC in organisations and society (Abhayawansa et al., 2018; Corbella et al., 2019; Rooney & Dumay, 2016; Veltri et al., 2015), the study of Autostrade advances a stronger version of performativity. This involves understanding IC references as objects that excite people to do things by relating knowledge via IC references to efforts through the institution of use-values, such as safety and mobility. Here, not only do people use IC citations; IC citations also influence people, or entice them into action, by generating excitement out of citations.

Our analysis may add to extant literature on IC and innovation (Subramaniam & Youndt, 2005; Chen et al., 2006; Wu et al., 2007, 2008; Zerenler et al., 2008; Hsu & Fang, 2009; Cabello-Medina et al., 2011; Delgado-Verde et al. 2011; Leitner, 2011; Bellora and Guenther, 2013; Carmona-Lavado et al. 2013; Martın-de-Castro et al., 2013; Elsetouhi et al., 2015) showing how over a span of 20 years, IC citations consistently play a role in interconnected innovation processes.. In response to the question, this analysis shows how ostensive research's focusing on innovative effects and qualitative research's attention to interpretations and meaning may co-exist. The analysis provides a comprehensive understanding of the emergence of innovation and the intricate role of IC information (continuous citations) in establishing an orientation to such innovation work through the lens of use values, even if its situated outcome is difficult to predict. Bushy innovation as a sequence of innovation activities is motivated if not entirely shaped by the relentless attention to use values associated with IC citations.

The bushy innovation patterns hold together a sense of durability under conditions of ambiguity and uncertainty. This is a melody, to refer back to Edvinsson, with a theme but many different improvisations, complexities, high aspirations, as well as despair and danger.

Appendix

See Table 1

Table 1 Overview of the reports analysed in this study

Year	Nominal report type and content organisation
2003	*Annual Report (*Environment and sustainable development. Communication. Research and development. Human resources and organisation. Economic and financial performance. Asset management)
2004	*Environmental and Social Report (*Vision and strategy for sustainability. Organisation, governance, management and control. Financial dimension. Social dimension. Environmental dimension
2005	*Annual Report (*Sustainability section. Corporate governance. Social dimension. Staff. Government and institutions. Community. Shareholders and investors. Suppliers Innovation research and development. Environmental dimension. Socioeconomic indicators)
2006	*Annual Report (*Sustainability section. Corporate governance. Social dimension. Staff. Government and institutions. Community. Shareholders and investors. Suppliers Innovation research and development. Environmental dimension. Socioeconomic indicators)
2007	*Annual Report (*Profile. Report on operations. Operating performance. Traffic. Toll charges. Investments. Service areas. Innovation, research and development. International activities. Workforce. Corporate governance. Sustainability. Significant regulatory aspects)
2008	*Annual Report (*Profile. Report on operations. Operating performance. Traffic. Toll charges. Investments. Service areas. Innovation, research and development. International activities. Workforce. Corporate governance. Sustainability. Significant regulatory aspects)
2009	*Annual Report (*Profile. Report on operations. Operating performance. Traffic. Toll charges. Investments. Service areas. Innovation, research and development. International activities. Workforce. Corporate governance. Sustainability. Significant regulatory aspects)
2010	*Annual Report (*Profile. Report on operations. Operating performance. Traffic. Toll charges. Investments. Service areas. Innovation, research and development. International activities. Workforce. Corporate governance. Sustainability. Significant regulatory aspects)
2011	*Sustainability Report (*Group profile. Sustainability strategy. Commitment to sustainability. Economic accountability. Social accountability. Environmental accountability Global Reporting Initiative (GRI) Content Index)
2012	*Integrated Report (*Profile of the report. *Integrated Report* scope and reporting boundary. Group profile. Types of capital: infrastructural, financial, human, natural, social and intellectual Annexes
2013	*Integrated Report (*Group profile. 2014 Charter of Sustainability Commitments. Materiality and stakeholder engagement. Types of capital: infrastructural, financial, human, social, natural and intellectual. Annexes)
2014	*Integrated Report (*Group profile. 2015 Charter of Sustainability Commitments. Materiality and stakeholder engagement. Types of capital: infrastructural, financial, human, social and natural. Annexes)
2015	*Integrated Report (*Group profile. Materiality analysis and stakeholder engagement. Types of capital: financial, infrastructural, human, social and natural. Annexes)
2016	*Integrated Report (*Group profile. Materiality analysis and stakeholder engagement. Types of capital: financial, infrastructural, human, social and natural. Annexes)
2017	*Integrated Report (*Risk management. Governance. Materiality analysis and stakeholder engagement. Sustainability map. Types of capital: financial, infrastructural, human, social and natural. Annexes)
2018	*Integrated Report (*Atlantia for Genoa. Group profile. Risk management. Governance. Analysis of materiality and stakeholder engagement. Types of capital: financial, infrastructural, human, social and natural)
2019	*Integrated Report (*Group profile. Risk management. Governance. Materiality analysis and stakeholder engagement. Sustainability map. Types of capital: financial, infrastructural, human, social and natural. Appendix)

Table 1 (continued)

Year	Nominal report type and content organisation
2020	*Annual Report (*Introduction. Report on Operations. Consolidated financial statements. Separate financial statements. Reports. Key indicators extracted from the financial statements of subsidiaries, associates and joint ventures. Shareholders' resolutions)
2021	*Annual Report (*Introduction. Report on Operations. Consolidated financial statements. Separate financial statements. Reports. Key indicators extracted from the financial statements of subsidiaries, associates and joint ventures. Shareholders' resolutions)
2022	*Sustainability Report (*Letter to stakeholders. Responsible business. Autostrade for the environment. The people of Autostrade per l'Italia. New mobility model)

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Declarations

Competing interests We have no relevant financial or non-financial interests to disclose. We have no competing interests to declare that are relevant to the content of this article.

Ethical approval We declare that the submitted manuscript is compliant with ethical standards.

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