Visualizing and managing value creation through integrated reporting practices: a dynamic resource-based perspective

Visualizing and managing value creation through Integrated Reporting practices: A Dynamic Resource-based perspective

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Abstract:
The article builds on the current debate on how accounting tools can assist top management teams to manage their resources, while communicating a variety of data and information about value creation to their stakeholders. Within this debate, the study focuses on a recent tool for corporate reporting, the Integrated Reporting (<IR>), and investigates its utility to support the development of a holistic model for managing strategic resources to create value. To operationalize the <IR> according to this perspective, the article combines <IR> with the Dynamic Resource-Based View (DRBV) of the firm on the basis of their common idea that strategic resources are interconnected and have to be managed with the collaboration of all stakeholders in order to inform governance actions and create value with a holistic perspective. For the two case studies analyzed, the <IR> information is specifically organized and re-framed using "resource mapping", which is a DRBV-based visual and analytical technique representing the causal relationships between resources and governance actions. In this way, we expect to describe and communicate the dominant logic in the business and the leverage points where the value creation process lies, supporting the usefulness of Integrated Reporting as a management and governance tool.

Keywords: Integrated Reporting; Dynamic Resource Based View; Value creation; Resource mapping; Management and governance tool.

1. Introduction

A wide body of literature is currently analyzing and debating principles, guidelines and values used by modern organizations to manage their operations, gain competitive advantage, communicate value creation activities, and report subsequent performance (Adams 2004; Gray 2006; Eccles et al. 2015). In particular, over the last few years, many companies across different industries and all over the world released reports and communications based on a voluntary disclosure of data and information related to environmental, sustainability and corporate social responsibility (see Belkaoui and Karpik 1989; Tian and Chen 2009). However, these actions also led to a variety of accounting reports with heterogeneous contents, aims and communication forms, spanning from quantitative reports to mostly narrative reports - especially in the field of corporate social responsibility (see Beattie and Smith 2013; Dumay 2016; de Villiers and Sharma 2017). The diversity in reporting stimulated the debate towards the definition of *integrated* forms of reporting, including both financial values as well as sustainability, social and environmental information relevant for all of the organization's stakeholders (e.g., Eccles and Saltzman 2011; Dumay 2015).

Specifically, this study focuses on *Integrated Reporting* (hereafter <IR>), a report whose ultimate goal is to "support integrated thinking, decision making, and actions that focus on sustainable value creation for stakeholders" (IIRC 2013a, p. 35). Specifically, <IR> builds on the idea of bringing together financial and

sustainability reporting practices in order to support strategic decision making and create long-term sustainable value (Abeysekera 2013; Adams 2015). <IR> is currently regarded as a positive example "of contemporary managerial innovation" (Busco et al. 2013a, p. 34) and is receiving attention and positive comments within the management accounting literature (Beattie and Smith 2013; Atkins et al. 2015a; Burke and Clark 2016). However, some questions on the implementation of <IR> and the related consequences on both the internal and external business processes are still unanswered, requiring further research on the topic (de Villiers et al. 2014; Dumay et al. 2016). Among the questions to be addressed, there is also a lively debate about how to effectively embed <IR> practices into the actual decision-making process, thus going beyond the "simple" disclosure of data and information, instead acting as a management and governance tool (Westwood 2014; Druckman 2014; Eccles et al. 2015). Academics as well as practitioners are also pointing out the numerous challenges entailed by the choice of tools and techniques potentially useful to *operationalize* <IR> and Integrated Thinking in practice (KPMG 2011 and 2012; Busco et al. 2013b; de Villiers et al. 2014; CIMA 2014; Barnabè 2016; Moolman et al. 2016).

This article aims to contribute to this debate and fill a gap in this literature, by enhancing the <IR> beyond the simple communication tool with the adoption of a specific perspective, the Dynamic Resource-Based View (hereafter DRBV) (Kunc and Morecroft 2010; Warren 2002). The DRBV assumes that strategic resources (or capitals, according to the <IR> terminology) need to be managed simultaneously in order to create value in a holistic perspective. Therefore, this study illustrates the application of the DRBV approach to <IR> in order to improve the <IR> usefulness as both a management and governance tool (Flammer and Luo 2017).

The article is structured as follows: the next two sections provide the literature review and our proposal, while the following two ones present the research method and the results; the discussion, the limitations and further research of the study, and the conclusion conclude this work.

2. Literature Review

2.1. The evolution of corporate governance: from managing "for" stakeholders to managing "with" stakeholders

The article builds on the current debate that focuses on how management and governance tools can assist decision-makers to communicate a variety of data and information about value creation to all their stakeholders (Hutton 2004; Burgman and Roos 2007; Eccles and Krzus 2011; Eccles et al. 2015).

In a context characterized by global competitiveness, public pressure for greater corporate social responsibility and new organizational models, disclosing relevant information and building a strong relationship with the various categories of stakeholders, is becoming more and more important for organizations (see Krzus 2011). Indeed, the same definition of "stakeholders" as all individuals or groups who can affect or be affected by the organization's activities and "without whose support the organizations would cease to exist" emphasizes the relevant role played by them on the organization's aim of creating value over time (Stanford Research Institute 1963, cited by Freeman 1984, p. 31). In this perspective, the traditional financial approach analyzing the process of value creation just in terms of the rent received by shareholders is replaced by the idea of a "stakeholder value created", including the rent or benefits produced by the organization for all of its stakeholders. Instead of the traditional measures such as Economic Value Added or Market Valued Added, this perspective requires both new models to measure the value created by the organization and new governance mechanisms to manage effectively the value creation process, such as the one proposed by Charreaux and Desbrières (2001).

As a consequence, new governance mechanisms and tools that support the value creation process on the assumption that "managing for the stakeholders' interests" is beneficial for the overall organizational performance has been suggested by Donaldson and Preston (1995), Freeman (1984), Jones and Wicks (1999), Freeman et al.

(2007), and Harrison et al. (2010). These studies highlight the effectiveness of "managing for stakeholders" models according to a holistic approach, suggesting that no stakeholder interest (including the shareholders' one) can be satisfied without considering the other interests involved (Freeman et al. 2007). However, how to establish and maintain win-win associations with all the organization's stakeholders is still a question without a definitive answer (Svendsen 1998; Andriof et al. 2002).

There is a need for a relational model that could overcome the idea of stakeholders "managed" in order to pursue the organization's mission. This is the assumption underlying a "broader" model of corporate governance, conferring to stakeholders specific rights and responsibilities in the management of the business activities with the aim to create a "mutually beneficial and just scheme of cooperation" that should avoid negative externalities on the organization's performance (Phillips 1997, p. 54)[1]. On this basis, the "managing for stakeholders" approach may be developed into a "managing with stakeholders" approach that reflects multiple strategic values for organizations and builds on the active participation of stakeholders in the development of the governance actions (Greenwood 2007).

One of the starting points of this multi-stakeholders approach is certainly the development of a corporate reporting useful to both inform stakeholders about the overall impact of the business activities (information function), and facilitate, as a governance tool, their active participation in the decision-making process of the organization ("transformation" function) (Eccles and Serafeim 2014; Morsing and Schultz 2006). The traditional financial statements are not sufficient to achieve both these aims, since they are not able to solve entirely the information asymmetry problems between the organization's insiders and its stakeholders, as well as to portray all aspects of value creation processes that are increasingly depending on intangible assets (Amir et al. 2003; Lev and Zarowin 1999; Eccles and Mavrinac 1995). As a consequence, in the last decades, stakeholders have asked for additional non-financial information about the organization's activities, even with the consequence of causing complicated situations of "information overload" (Stolowy and Paugam 2018).

Recently, the necessity of integrating corporate reporting with non-financial information on the organization's social and environmental responsibility has been stressed also by the Directive 2014/95 of the European Union, according to which "disclosure of non-financial information helps the measuring, monitoring and managing of undertakings' performance and their impact on society" (Directive 2014/95/EU, Recital 3). In the literature, however, this necessity has been associated with the development of various forms of corporate reporting, specifically aimed at integrating the financial information on the organization with a complete disclosure of the non-financial dimensions of the activities implemented. All of the frameworks proposed were derived from the idea of developing "one report" (see Beattie and Smith 2013; Eccles and Krzus 2011; Eccles and Saltzman 2011) on the business activities, such as GRI (Global Reporting Initiative) or other CSR (Corporate Social Responsibility) reports and frameworks (Eccles and Krzus 2011, Milne and Gray 2013; Dumay 2015; de Villiers and Sharma 2017), useful to present and evaluate an organization according to a multidimensional perspective.

Among them, this study focuses on one of the latest novelties of corporate reporting which is receiving particular interest in the management accounting literature due to both some potential benefits and a few unresolved questions concerning its implementation. We are referring to the *Integrated Reporting* (<IR>) (IIRC 2013a), whose effectiveness in communicating to stakeholders needs to be further investigated.

[1] This first explanation of the term "stakeholder" appeared into an internal memorandum of the Stanford Research Institute in 1963 (Freeman and Reed 1983; Freeman 1984), but its adoption spread in Europe only in the 1980s and 1990s with many other definitions (see Mitchell et al. 1997, p. 858).

2.2. The role of <IR> in analyzing and communicating value creation processes

2.2.1. A brief overview of the <IR> framework

<IR> is a model of corporate reporting developed by the *International Integrated Reporting Council (IIRC)* to represent and communicate the organization's process of value creation. <IR> adheres the managerial principle of *Integrated Thinking* and the underlining necessity of a decision-making process that considers the interrelationships existing among the organization's stakeholders, business units, functions, and resources. Based on this idea, the IIRC framework (IIRC 2013a) underlines the importance of an integrated reporting process to consolidate the organization's information into one document.

The <IR> represents the value created (or eventually destructed) by the organization for all of its stakeholders, assuming that "value is created through an organization's business model, which takes inputs from the capitals and transforms them through business activities and interactions to produce outputs and outcomes" (IIRC 2013b, p. 9).

The starting point of the value creation process is the set of organization's *inputs* that contribute, through the *business activities*, to the realization of the organization's *outputs* (i.e., products or services) offered in the market. The process ends with the *outcomes* obtained from the outputs sale, which includes both techno-economic outcomes, related to the process innovation and the organization's profitability, and psychosocial outcomes, referring to the development of feelings such as self-esteem and trust inside and outside the organization (Tikkanen and Alajoutsijärvi 2001). The entire process is developed as a dynamic and circular system since the outcomes, which represent the value created for the different stakeholders, affect the organization's availability of inputs (see Figure 1). Actually, not all of the inputs included in the business model are internal and owned by the organization, but all of them have to contribute to create value through the services rendered (Penrose 1959).

[FIGURE 1 HERE]

Fig. 1 The process of value creation at the basis of integrated reporting, resembling a sort of "helicopter"

Specifically, the IIRC framework (see IIRC 2013a, p. 13) identifies six categories of inputs, named *capitals* (IIRC 2013c). They are the *financial* capital, including all funds (both debt and equity financing) available to the organization, the *manufactured* capital, corresponding to the set of equipment and tools adopted in the production process, the *human* capital, referring to the stock of knowledge, skills, and competencies embodied in the organization's people (managers included), the *intellectual* capital, including different types of intangible assets providing a competitive advantage (such as the organization's reputation, its brand or intellectual property), the *social* capital, embodying the set of relationships between the organization and its stakeholders, and the *natural* capital, including all of the environmental resources (such as water, soil, and air) affecting (and affected by) the organization's action.

<IR> also represents how the capitals are employed by the organization to create value for all of the stakeholders in compliance with some specific guiding principles, such as the strategic focus and future orientation, the connectivity of information, materiality, and stakeholder relationships aimed to their direct involvement in the governance actions (IIRC 2013a, p. 17).

2.2.2. <IR> potentialities and limitations: a still open debate

In line with a multi-stakeholders perspective, <IR> has the potential to support the organization in better understanding the stakeholders' expectations as necessary condition to improve the decision-making process and

the relationship with them (Eccles and Krzus 2010). Consequently, <IR> is likely able to provide an array of benefits, both internally and externally. First, Burke and Clark (2016, pp. 275-276) underline, internally <IR> may guarantee "a better understanding of value creation, resulting in more informed-and thus better-decision making", while externally, <IR> may "improve corporate relations through its streamlined disclosure of value-relevant information". Briefly, the <IR> adoption has the potential of facilitating broader management control (also favoring a more integrated conception of "value" - McNally and Maroun 2018), and the holistic picture of the business activities, with the related process of value creation provided by the report, may stimulate the beliefs about behaviors that enhance the organization's capability to create long-term value among stakeholders (Krzus 2011). Second, as retraced by de Villiers et al. (2014), the additional information potentially allows stakeholders making more accurate assessments of organizations and their performance together with the adoption of a single document that reduces the risk of duplicating the data furnished, increasing cohesion and efficiency of the reporting process. In brief, <IR> may be useful to combine external market benefits, related to the requirement of more Environmental, Social and Governance (ESG) information received by customers and investors with internal benefits related to greater stakeholder engagement and better resource allocation (Eccles and Saltzman 2011; Melloni et al. 2016; Beck et al. 2017), as emphasized in the literature for both the private and the public sector (e.g., Busco et al. 2013a and 2013b).

However, the debate on the topic is also characterized by some critiques to <IR> and/or to the IIRC's framework that encourage further investigation. For example, Flower (2015) criticized the IIRC's framework for having abandoned sustainability accounting and for promoting reporting practices focused on a concept of "value" which is intended for investors and not for the society. Cheng et al. (2014) underlined how an excessive weight is assigned to the providers of financial capital and no sufficient guidance is given to report and interpret trade-offs among the various typologies of capitals at an organization's disposal. Adams (2015) linked the potential success of <IR> to the related ability to correctly give a meaning to the term "value" (and "value to whom") and together with manifesting disappointment about the limited disclosure requirements concerning movements of capitals in the IIRC's framework. Atkins et al. (2015b, p. 652), emphasized that although approaches (such as Integrated Reporting) "may lead to improved quality and quantity of sustainability disclosures, they do not (at present) satisfy the needs of broad stakeholder groups". In a similar way, Perego et al. (2016, p. 54) argued that most companies still "have weak understanding of the business value of integrated reporting" and, more in general, "how integrated reporting may be successfully implemented remains challenging and contested". Finally, de Villiers et al. (2014) and Rinaldi et al. (2018) identified several research gaps related to <IR> practices and analyses, such as the <IR> ability to simultaneously consider all of the capitals *and* all of the perspectives suggested by IIRC.

Due to these opposing considerations, further investigations are required to test the <IR> potentials. In this study, we aim to contribute to the debate arguing that <IR> has to be considered much more than a communication, or a process leading to draft a report. Indeed, relying on the ideas of *Integrated Thinking* and *Integrated Management* at its core, <IR> pursues the primary goal to enhance accountability and stewardship with respect to the core set of "capitals" (Camilleri 2017), specifically promoting the understanding of their interdependencies (Barnabè and Giorgino 2013). Subsequently, <IR> has the potential to "support integrated thinking, decision making, and actions that focus on the creation of value" for stakeholders (IIRC 2013a, p. 3). However, to concretely make <IR> a management and governance tool, useful to both inform managers' decision-making and develop governance actions in a multi-stakeholders perspective, some questions need to be addressed. Among them, how the organization's capitals are effectively managed in a holistic perspective, which are the dominant logic and the leverage points where the value creation process lies, and in which way the value created is distributed among all of the stakeholders.

To resolve these issues, our study suggests that the <IR> framework would benefit from the combination with management approaches and techniques supporting the operationalization of the report. More specifically, we propose the combination of the <IR> framework with the approach suggested by the Dynamic Resource-Based View (DRBV) (Kunc and Morecroft 2010; Warren 2002).

2.3. A Dynamic Resource-Based perspective

2.3.1. The Resource-Based View of the Firm

The starting point of the framework adopted in this paper is the resource-based view of the firm (RBV), according to which an organization's performance is determined by the set of "resources" and "capabilities" developed or acquired over time (Penrose 1959; Wernerfelt 1984; Barney 1986 and 1991; Peteraf 1993; Kunc and Morecroft 2009 and 2010). Specifically, performance heterogeneity across firms is determined by the level of heterogeneity in their resources and capabilities (see Barney 1991 and Peteraf 1993).

Resources, that can be tangible (e.g., customers, staff, or production capacity) and intangible (e.g., reputation, corporate culture, intellectual property) productive factors, are the assets that an organization possesses, controls or to which it has access (Dierickx and Cool 1989; Fink et al. 2005). *Capabilities* are instead the activities that an organization performs; and, usually, are generated by the interaction of resources combined with knowledge about the combination of these resources (Teece et al. 1990 and 1997; Grant 1991; Hall 1993; Fink et al. 2005; Kunc and Morecroft 2010).

Starting from these considerations, Kunc and Morecroft (2010) assert that managing an organization from a resource-based perspective implies two managerial-driven processes: the first one is the conceptualization of a set of key strategic resources that support the business model of the organization, while the second one is the management of the resources through governance actions, e.g., investments and disposals. The managerial rationale for the continuing resource accumulation and development strategy of the organization is traditionally referred to as the "*dominant logic*" (Prahalad and Bettis 1986; Prahalad 2004).

The result of these processes is *distinctive performance over time for the organization* in terms of value creation and satisfaction of stakeholders' requirements (Warren 2002 and 2008). However, the process of determining the resource profile is not straightforward since resources and capabilities need to be combined to deliver products, leading to complex systems of resources (Kunc and Morecroft 2009 and 2010; Grant 2016). Notably capabilities, that can be differentiated in operational capabilities (e.g., production, sales and customer service) and dynamic ones (e.g., product development), require investment of organizational resources (e.g., money, labor and technology) for their development (Rahamandad 2012).

2.3.2. The Dynamic Resource-Based View

In consideration of the previous reasons and with the ultimate aim to operationalize a resource-based perspective, Warren (2002) and Kunc and Morecroft (2009) proposed to combine traditional RBV concepts and ideas with System Dynamics modelling principles and tools (Forrester 1961 and 1968a; Richardson and Pugh 1981; Sterman 2000) into DRBV. Three key concepts are at the core of System Dynamics: stocks, flows, and feedback loops, that are useful for combining with RBV. *Stocks* (or state variables) characterize the state of the system and generate the information upon which decisions and action are based. Stocks can change only through the action of *inflows* and *outflows* that build or deplete them. *Feedback loops* subsequently emerge from the interaction of stocks and flows, being the basic structures "within which the system condition provides the input to a decision process that generates action which modifies the system condition", in "a continuously circulating process" (Forrester 1968b, p. 402). In brief, System Dynamics' representation of an organization as a system "consists of the feedback loops,

stocks and flows, and nonlinearities created by the interaction of the physical and institutional structure of the system with the decision-making processes of the agents acting within it" (Sterman 2000, p. 107).

From an operational point of view, and specifically to address the issue of the resource profile conceptualization, the DRBV approach requires a process or methodology used to elicit and formalize the understanding of the system of resources, determine the information considered by the managers in making decisions, and make visible existing paths of value creation used in formulating policies for resources investment (Kunc 2008; Kunc and Morecroft 2009 and 2010; Kazakov and Kunc 2016). To this aim, pivotal to the DRBV approach are the graphical methodology known as *resource mapping* and the deriving output called *resource map* (Kunc and Morecroft 2009).

Resource mapping is a facilitative device that can be used by individuals or groups, both internally or externally to the organization under analysis. Specifically, resource mapping is a qualitative methodology developed to help managers and organizations to visualize the system of strategic resources, the "resource profile" (Kunc and Morecroft 2009). Resource maps aim to represent the resources and their accumulation and depletion rates, as well as their linkages, using specific graphical notation. This representation is used to make explicit the resources that are strategically relevant, support the identification and exploitation of key value creation leverage points and also facilitate (group) discussion and external analyses about the relevance and management of critical resources and value creation patterns during strategy design and implementation processes (Kunc and Morecroft 2009). Thus, resource mapping reflects the integration of RBV and System Dynamics but it does not necessarily lead to a quantitative model as one might expect with traditional System Dynamics modelling.

Indeed, resource maps are essentially qualitative stock and flow diagrams and build on a wide and relevant body of literature advocating the use of graphical tools and strategic management maps (e.g., Strategy Maps within the Balanced Scorecard system) (see Kaplan and Norton 1992, 2000 and 2004) to inform and support decision-making and governance actions (e.g., Senge 1990; Wolstenholme 1999 and 2003; Sterman 2000; Lane and Husemann 2008; Meadows 2008).

2.4. Enriching <IR> with a Dynamic Resource-Based view

We propose to adopt the DRBV approach (and its related methodology of *resource mapping*) to overcome the limits existing to operationalize the <IR>, thus enhancing the potentials of <IR> as both a management and governance tool. Our proposal builds on the observation that DRBV and <IR> have a common theoretical setting, since they share the idea that organizational capitals (or resources, adopting the DRBV terminology) are interconnected and need to be simultaneously managed in order to create value in a holistic perspective (see the parallelism between <IR> and DRBV in Figure 2). The resource map, which is the outcome of resource mapping, represents the data existing in <IR> in a visual way while presenting the mechanisms underlying the value creation process developed by the organization.

[FIGURE 2 HERE]

Fig. 2 Parallelism between <IR>'s and DRBV's business model patterns

More specifically, since the <IR> framework is "principle-based", and any organization may adapt and tailor it in consideration of its capitals, business activities, stakeholders' needs and requests, building resource maps may allow to exploit the report data and tackle two relevant issues related to the specific business model and governance system in place. These issues are dynamic complexity and causal ambiguity.

The former (i.e., *dynamic complexity*) can be defined as the product of the interactions between the components of a system, e.g. many resources are interconnected forming feedback loops that drive growth (Sterman 2000). The latter (i.e., *causal ambiguity*) is subsequently treated in a resource-based perspective through the identification of the causal relationships and their types existing in the specific business domain under investigation (Kunc and Morecroft 2010). In this respect, System Dynamics have some methods to evaluate the complexity of structures in terms of dynamic complexity and causal ambiguity. For example, the number of resources and feedback loops can be associated with the concept of density in the structure (Schaffernicht and Groesser 2011; Torres et al. 2017).

The choice of which stocks and flows to model is unique for any organization (and integrated report) under analysis, heavily depending on the managerial cognition, defined as the result of the managers' *dominant logic* and *mental models* (see Prahalad and Bettis 1986; Prahalad 2004; Vennix 1990 and 1996; Gary and Wood 2011). However, resource maps differ from other maps and tools traditionally used in Systems Thinking and System Dynamics. Indeed, whereas "a stock and flow diagram has all the formalities (Sterman 2000, Chapter 6) required for a system dynamics model, (…) a 'resource map' is just a picture to be used with managers as a basis for understanding and negotiating competitive strategy" (Kunc and Morecroft 2009, p. 193). In this specific regard, a resource map may play a powerful role in supporting resource conceptualization (Kunc and Morecroft 2009), mobilizing knowledge, improving individuals' mental models and performance (Humphreys et al. 2016), enhancing the alignment of a given organization with its measurement system (Kunc 2008)[2].

In detail, our proposal is to use DRBV and resource mapping to understand the dynamic complexity and the causal ambiguity represented in <IR>, in order to represent the dominant logic of the top management team communicated in the report, and consequently transform <IR> into an enriched management and governance tool.

3. Research Method

This article adopts the multiple case studies methodology (Yin 1994), developing the analysis on two separate study objects in order to highlight differences and similarities between them (Baxter and Jack 2008). Case study is a research strategy that creates propositions from case-based, empirical evidence, aimed to capture the complexity of the object under analysis (Eisenhardt 1989; Stake 1995). Focusing more specifically on research methodology in accounting, our study can be considered an "exploratory case study", suitable "not only to explore the reasons for particular accounting practices" but also for enabling "the researcher to generate hypotheses about the reasons for particular practices" (Ryan et al. 2002, p. 144). In our analysis, we considered the data entered in the two latest (i.e., 2015 and 2016) integrated reports drafted by two well-known Oil&Gas organizations (i.e., SASOL and ENI). These data are used to develop two tailored resource maps (Kunc and Morecroft 2009) aimed to understand how the suggested enrichment to <IR> will work and provide propositions about the organizations' governance actions and value creation processes.

The main reason for choosing SASOL and ENI as our case studies is that organizations operating in the Oil&Gas, mining (i.e., basic materials) and/or energy sectors are particularly active in reporting the outputs and outcomes of the activities to all their stakeholders for several reasons. First, these organizations frequently operate in several countries across the world and provide products, by-products and services to customers spread worldwide. Second, through their operations these organizations tend to generate a variety of environmental impacts (e.g., GhG emissions), and natural resources consumption. Last, they are usually strongly involved with

[2] More specifically, we emphasize that a resource map may or may not require quantification (see Warren 2002 and 2008 for examples) or formal algebraic modelling and simulation (of the kind used in System Dynamics). Specifically, this choice depends on whether the issue facing the management team is essentially interpretist (reconciling conflicting views about strategy) or functionalist (seeking insight into the likely outcome of an agreed strategy), or somehow a combination of the two (see Kunc and Morecroft 2009 about this).

the communities of reference, for example in terms of employment, or social programs. Particularly, we could argue that the Oil&Gas is one of the most analyzed industries in terms of sustainability and reporting practices (Guenther et al. 2007; Kolk 2010; Roca and Searcy 2012; Alazzani and Wan-Hussin 2013). Additionally, we believed that choosing two organizations operating in the same industry, and then with similar production processes, allowed a high degree of comparability for the two resource maps in terms of strategies and value creation processes while highlighting the differences between them. A multiple or collective case study is indeed useful to understand the similarities and differences between the cases, successively supporting the prediction of similar or contrasting results based on a theory (Yin 1994; Stake 1995).

Notably, SASOL and ENI are two of the early pioneers in the field of <IR> and have long joined the IIRC program, releasing multiple integrated reports to date. As mentioned, this work focuses on the two latest annual Integrated Reports for both companies, i.e., the 2015 and 2016 IRs (respectively retrieved from the web in date 2 December 2016 - for the two 2015 releases - and 9 June 2017 for the two 2016 releases), in order to analyze the most updated releases of the report and to ensure a more complete analysis of data and information[3].

Based on these reports, we employed a methodology to construct the resource maps corresponding to each company followed by their analysis in terms of dynamic complexity and causal ambiguity.

Specifically, the research design entailed following four stages, respectively based on the use of:

- content analysis of the four annual integrated reports, aimed at identifying the key <IR>-related concepts (i.e, business model, value creation process and key performance indicators) (Krippendorff 2004);
- coding technique of the information retrieved in order to find relationships among the concepts, variables and codes identified (Kim and Andersen 2012);
- resource mapping (Kunc and Morecroft 2009) for both the organizations considered in this study, relying on the software Vensim (Eberlein and Peterson 1992);
- SDM_Doc software to evaluate the structure of the resource maps in terms of issues related to causal ambiguity and dynamic complexity (Martinez-Moyano 2012).

Full details about the methodology are provided in the Appendix, while section four provides the results.

4. Results

This section directly provides the main results of the process of resource mapping developed for the two case studies analyzed considering the steps previously outlined.

First of all, the complete resource maps, that represent the ultimate result of this study, are displayed in Figure 3 and Figure 4.

Fig. 3 SASOL's complete resource map

[FIGURE 3 HERE]

Fig. 4 ENI's complete resource map

[3] Due to copyright issues the reports (or images from the reports) cannot be presented in this article. The full reports are available at the following web addresses:
ENI 2015 - https://www.eni.com/docs/en_IT/enicom/company/integrated-annual-report-2015.pdf.
ENI 2016 - https://www.eni.com/docs/en_IT/enicom/publications-archive/publications/reports/reports-2016/Integrated-Annual-Report-2016.pdf.
SASOL 2015 - http://www.sasol.com/extras/air_reports/air_2015/files/assets/basic-html/page-1.html#.
SASOL 2016 - http://www.sasol.com/financial-reports/annual-integrated-report-30-june-2016.

[FIGURE 4 HERE]

The two resource maps clearly and comprehensively represent the resources at the two organizations' disposal, the actions carried out and the value creation outcomes (red concepts). Specifically, it is to note that for each company the resources are grouped into several categories, similarly to what described by the IIRC Framework (IIRC 2013a and IIRC 2013c) (see Table 1). Moreover, these categories are portrayed in the two maps using colored boxes which group together variables (either resources, flows or auxiliaries), and can be thought of as sub-systems (see Sterman 2000, pp. 99-102). Overall, these boxes constitute the general architecture of the <IR>-based resource maps.

Table 1. Typologies of capitals/resources in <IR> and for SASOL and ENI

Typologies of Capitals/Resources (<IR> Framework)	*Typologies of Capitals/Resources (SASOL – 2015)*	*Typologies of Capitals/Resources (SASOL – 2016)*	*Typologies of Capitals/Resources (ENI – 2015)*	*Typologies of Capitals/Resources (ENI – 2016)*
Financial	Financial capital	Financial	Financial	Economic and financial
Manufactured	Manufacturing excellence	Manufactured	Productive	Operating performance
Intellectual	Intellectual property	Intellectual	Intellectual	Innovation and research
Human	People	Human	Human	People and safety
Social and relationship	Relationships with stakeholders	Social and relationship	Social and relationship	Social, human rights and transparency
Natural	Natural Resources	Natural	Natural	Environmental and climate

The two resource maps undoubtedly provide a comprehensive representation of the two organizations and can be inspected in order to analyze the concepts of *dynamic complexity* and *causal ambiguity*. Specifically, Table 2 provides several quantitative data for the two organizations' resource maps.

Table 2. Quantitative analysis of the resource maps.

	Number of stocks/ resources	Number of outcomes	Number of capabilities	Causal links with positive polarity	Causal links with negative polarity	Number of total causal links
SASOL	23	7	18	138 (70,41%)	58 (29,59%)	196 (100%)
ENI	16	9	15	113 (76,87%)	34 (23,13%)	147 (100%)

There are some interesting insights from Table 2. In broad terms, and with specific reference to dynamic complexity, the Table reveals that the two resource maps include 23 stocks for SASOL and 16 stocks for ENI; the combination of the stocks generate 7 value creation outcomes for SASOL and 9 value creation outcomes for ENI.

Additionally and with reference to the concept of causal ambiguity, the data show that SASOL's map includes 138 positive causal links and 58 negative causal links (an approximate ratio of 2 positive for each negative) while ENI's map includes 113 positive and 34 negative links, with a ratio of 3 positive links for each negative link. Overall, we emphasize the existence of more negative linkages in SASOL than in ENI (both in absolute terms and in relative percentage). Actually, a higher number of negative linkages can be associated with the existence of more assets in SASOL than in ENI. Assets, especially mining assets, are associated with negative flows as they

are continuously depleted. Positive linkages can be associated with growing processes that do not consume assets (e.g. technology investments such as in the case of ENI). Additionally, from the data shown in Table 2, SASOL's business seems to be more complex in terms of structure: more components –resources and capabilities– and interactions between components –more number of causal linkages. However, in SASOL the value outcomes are lower than in ENI. There seems to be an inverted relation between value outcomes and complexity of the business but we do not have enough evidence for this. However, this can be an interesting further avenue for research.

The analysis of the two resource maps return results which are mesmerizing in terms of complexity embedded in the organizations. Specifically, Table 3 takes into consideration the number of feedback processes affecting each of the <IR> capitals as identified in the two complete maps; in detail, the percentages refer to the ratios between the number of loops affecting each capital and the total number of loops, thus highlighting the relative weight of each resource in the value creation process of the two organizations. Notably, it is the combined approach of <IR> and DRBV that favors the identification of *Key Value Creation Spots* (KVCS) as resources or value outcomes affected by dense feedback processes that are controlled by the management of the organization or its stakeholders. Basically, the resources and variables which contain most of the feedback loops become critical, then KVCS, for the organization, since they are considered the most relevant ones for the business processes. Stated differently, the density can be adopted as a proxy of the resource relevance (Kunc and Morecroft 2009 and 2010). Tables 3 and 4 offer the evidence to identify those KVCS.

Table 3. SASOL's and ENI's IR capitals and the feedback processes responsible for the dynamics of value creation

SASOL's capital/resource	*Pct. of loops involving this resource*	*ENI's capital/resource*	*Pct. of loops involving this resource*
Financial capital	~100%	Financial structure	~0%
Debt	~0%	Liquidity reserves	98%
Equity financing	~0%		
Hydrocarbon (gas) reserves	21%	Onshore and offshore plants	27%
Onshore and offshore plants	62%	Pipelines and storage plants	19%
Pipelines and storage plants	29%	Liquefaction plants	33%
Gas-to-Liquids plants	40%	Refineries and Petrochemical plants	33%
Distillation plants	37%	Distribution Networks	57%
Distribution Networks	58%	Power plants	32%
Coal Assets	22%	Buildings and other equipment	13%
Coal-to-Liquids plants	20%	Hydrocarbon (oil and gas) reserves	3%
Reactor plant	17%		
Crude Oil and Liquids	2%		
Refineries	8%		
Other purchased feedstocks	9%		
Chemical Plants	8%		
Power Plants	57%		
Building and other equipment	11%		
Technologies and patents	51%	Technologies, ICT and Intellectual property	40%
Management systems and processes	51%	Corporate internal procedures / Management and control systems / Corporate Governance / Integrated Risk Management	37%
Knowledge and skills / Experience	98%	Know-how and skills / Experience	94%
Relationship capital	26%	Relationship with stakeholders	58%
SASOL reputation	30%	ENI brand + Reputation	54%
		Biorefinery and Alternative energy sources	20%

These results point out the centrality of financial resources and knowledge as core capitals in both organizations. Moreover, while dense interconnections are demonstrated through the degree of centrality in terms of feedback processes, the low number of interconnections for some resources opens the debate on their importance in the organization and for the future strategies.

Similarly, Table 4 focuses on the impacts of value creation in a multi-stakeholder perspective, displaying the percentage (on the total number) of feedback processes affecting each outcome-variable (red items) identified in this study for the two organizations.

Table 4. SASOL's and ENI's IR outcomes and the feedback processes responsible for the dynamics of value creation

SASOL's outcome	*Pct. of loops involving this outcome*	*ENI's outcome*	*Pct. of loops involving this outcome*
Share price appreciation	0%	Share Price appreciation	~0%
Yields	~0%	Yields	~0%
Employment Enhancement	97%	Employment and Job Enhancement	98%
Environmental footprint and social impacts	10%	Environmental and social impacts (blow-out risk, fight against corruption, wellness and satisfaction of ENI's people and local communities, ...)	47%
Pollution and waste (gas flared, particles, water usage, land usage)	14%	Pollution (gas flared, oil spill, GHG emissions, erosion of biodiversity, water consumption)	18%
Excellence in Science and Technology	2%	Transfer of best available technologies, expertise and know how to host Countries, territories and communities	7%
Social and economic development	3%	Availability of energy sources and green products	11%
		Socio-economic growth	16%
		Customers and Suppliers Satisfaction	68%

As already mentioned, also Table 4 provides remarkable insights in terms of density and KVCS. For example, it is interesting to observe the importance of managing the human resources as they can impact in almost all KVCS determining the organizational dynamics (see Table 4 highlighting that the outcomes "Employment enhancement" for SASOL and "Employment and Job Enhancement" for ENI are interested by, respectively, 97% and 98% of feedback loops). Another similarity between SASOL and ENI refers to the KVCS related to pollution, interesting a similar percentage of loops (respectively, 14% and 18%). On the contrary, other interesting observations are the differences between the two organizations in terms of the importance of customers (no mention in SASOL, but almost 68% of the processes in ENI) and environmental and social impacts (almost 10% in SASOL, but 47% in ENI) as KVCS.

Before moving to the discussion of these results, it is relevant to stress again that the two resource maps provide a visual yet comprehensive representation of the business domains under analysis and, at first sight, they may even look *over-complex*. However, they may be easily split into smaller "pieces" to get a glimpse of how value creation occurs across the various areas of the organization (connecting resources, flows and capabilities, and forming feedback loops), and subsequently inform discussion among relevant stakeholders in reference to specific resources, actions and outcomes.

As an example, consider the following Figure 5 which portrays a small section of the ENI's resource map.

[FIGURE 5 HERE]

Fig. 5 Detail from ENI's resource map

In detail, this Figure (which was rearranged to increase its intelligibility) represents a process involving 3 stocks of capital (resources), 3 value outcomes and several governance actions across two sub-systems (Social and Relationship, and Productive) in ENI's resource map. Notably, this part of the resource map also reveals the existence of two feedback loops connecting such resources and value outcomes, a positive - or reinforcing one - and a negative - or balancing- one (see the Appendix for more details on their structure).

Overall, the Figure provides an example of how resource mapping works in practice, starting from the analysis of an integrated report (in this case, the ENI's integrated report 2015) and traducing a textual - linear-oriented - description of value creation processes into a visual - feedback-oriented and DRBV-based - representation. Stated differently, this process allows transforming "raw data" (contained in the integrated reports) into a single comprehensive resource map, that is to say the addition of DRBV principles and visual tools allows visualizing these same concepts broadening the view to the whole set of causal linkages and feedback processes involving the stocks of capital. The simple example in Figure 5 also clarifies that the identification of feedback processes in a resource map is fundamental in order to understand *how* value is created over time, and according to *which* actions and strategies. However, the identification of all feedback processes can only be performed by mapping all relationships, as we did in the full resource maps, and using specialized software to account for them. This information clearly indicates the daunting task that involves managing a company. Notably, this analysis can be carried out extensively centering the focus on any variable (resources, outcomes, and capabilities) in the map, for example on *Key Value Creation Spots*.

As we will discuss subsequently, the considerations above trigger another one: it is essential not only to visualize the complex pattern of feedback loops generated by the management of the organization's resources, but also to identify and exploit the ones identified as being critical for the value creation process in a multi-stakeholder perspective.

5. Discussion

We can now discuss some of the main contributions and propositions from our work separating the usefulness of the suggested DRBV enrichment of the <IR> in terms of management and governance utility.

5.1. The utility in the managerial context

The case studies presented definitely show that the combined approach between <IR> and DRBV can support organizations and decision-makers to develop "integrated thinking", a key skill for governance. The enriched <IR> framework basically underpins the actual process of Integrated Reporting to consider organizational elements in a holistic perspective. The additional data and information provided by the resource map may be crucial to understand how these elements of the organization interact such as the fundamental linkages among capitals and between capitals and the determinants of value creation.

The study illustrates that a combined use of <IR> contents and guidelines, together with resource mapping, can generate a number of benefits in supporting the decision-making process in organizations.

a) The <IR>-based resource map contributes to the clear identification of all the organization's *capitals/resources*, visualizing them as stock variables or stocks of capital (Dierickx and Cool 1989; Kunc and Morecroft 2009). In this respect, the identification of resources can provide with better processes of governance for them since they are clearly labelled and the processes associated with their dynamics can be accounted and tracked. The density of feedback processes in resources reflects the actions driving the stock of capital. The density can be adopted as a proxy of the resource relevance, supporting managers in the identification of the key capitals/resources at disposal (Kunc and Morecroft 2009 and 2010). Notably,

previous studies already demonstrated how discovering and identifying a high number of feedback loops and causal relationships among key resources through modeling analyses allow increasing the managers' capacity to generate new strategic ideas through more developed mental models (Torres et al. 2017).

b) Resource mapping allows uncovering the causal ambiguity existing in a business through identifying linkages between components of the business followed by a structural analysis of the complexity existing in the resource map, such as density of causal links and characteristics of the relationships between parts of the business (positive or negative impacts/causal links). This information is useful to understand the dominant logic and mental models guiding management actions (Prahalad and Bettis 1986; Prahalad 2004; Vennix 1996; Gary and Wood 2011). Specifically, the ratios between positive and negative linkages we presented in section 4 suggest that ENI and SASOL reveal a dominant logic mostly oriented towards growth and reinforcement actions.

c) The accurate identification of the *flows* (both inflows and outflows) and *governance actions* in the resource map clearly shows how the managers build and/or erode the capitals over time (e.g., for SASOL the Financial capital is depleted whenever an investment is carried out, while it increases due to cash flow from operations). Notably, the management of financial resources is a critical task in any governance scheme so our results confirm the importance of adequate financial reporting. Additionally, resource mapping supports decision-makers in understanding the *trade-offs* among all capitals (e.g., for SASOL an investment decision will immediately erode the Financial capital, but will translate in an increased Intellectual capital through the generation of new patents and technologies). Interestingly, such an analysis is at the center of the <IR> debate (e.g., de Villiers et al. 2014; Cheng et al. 2014).

d) The DRBV enrichment of the <IR> supports managers in combining in a holistic perspective all of the activities that an organization performs, contributing to understanding which *capabilities* require to be enhanced (e.g., Teece et al. 1990 and 1997; Grant 1991 and 2016). For example, both organizations considered in our study heavily rely on technology as a main driver of development, improvement and competitive advantage. Subsequently, the resource maps built for SASOL and ENI assign a pivotal role to a few capabilities, such as "technological upgrade" and "process upgrade", in continually sustaining operations *and* strengthening value creation processes. Definitively, the importance of knowledge (in terms of density), which is at the same level as financial capital, indicates that organizational capabilities are critical to the creation of value.

e) The analysis of the density of feedback processes represented in the <IR> resource map provides useful information to evaluate the *dynamic complexity* existing in business models and its impact on value creation (Kazakov and Kunc 2016). Specifically, <IR> favors the visualization of value creation patterns as the ability to exploit the organization's resources to produce outputs and outcomes. This is mostly done in integrated reports through the presentation of chains of causes and effects, however linearly connected and/or textually (and wordy) described (Barnabè 2016). On the contrary, our enriched resource maps provide a feedback-oriented representation of the organizations' business models.

In sum, our analysis exploited the usefulness of the DRBV-enrichment of <IR> as a management tool, verifying its suitability to provide the organizations and their managers with the additional information useful to understand and explore interdependencies and connections among the factors at disposal (e.g., the capitals), as well as the determinants of value creation. In this light, the enrichment suggested is suitable to support decision-making in organizations, stimulating a shift from an *event-oriented approach* to decision-making (which is mostly adopted in <IR>) to a *feedback process-oriented approach* in strategy design and implementation (Kazakov and Kunc 2016; Kunc and Morecroft 2007). This is particularly relevant to develop plans and carry out actions based on a

comprehensive and holistic representation of the organizations' business domain, eventually exploiting all the benefits and potentialities of the management principle of "integrated thinking" in management accounting.

5.2. The utility in the governance context

About the second issue here investigated referring to the potential usefulness of the suggested <IR> enrichment as a governance tool, we need to remember that <IR> places a great emphasis on the role of stakeholders within the business domain and aims at assisting organizations drawing their own report not only to communicate value creation drivers and outputs to the stakeholders, but also to engage them during the process of value creation itself (IIRC 2013b). However, the <IR> data on the value creation process, although complete, may result disconnected for stakeholders, specifically for those without accounting knowledge or not accustomed to read accounting reports.

The analysis of the SASOL's and ENI's public reports illustrates the potentials of <IR> enhanced with visual DRBV methods to clarify which are the main determinants for value creation and the incredible complexity behind the process of creating value. In this regard and in broad terms, an IR - which is drawn up at the end of the process and on a yearly basis - not only provides a broad explanation of performance but also describes how different capitals contributed (or may contribute) to the generation of value. This would subsequently inform shared decision-making, specifically aligning resource management with stakeholders' needs and goals.

Particularly, we believe that resource mapping allows to "reorganize" <IR> data, make the value creation processes visible, and identify the leverage points for value creation in a broad, multi-stakeholder, and holistic perspective (Druckman 2014; Westwood 2014; Eccles et al. 2015). The maps allow identifying both the number of feedback processes involving each of the key resources managed by the organization and the outcome-variables that are subsequently affected by policies and actions centered on these resources. This provides information to stakeholders about not only the feedback processes responsible for value creation and organizational dynamics (Kunc and Morecroft 2009) but also the managers' mental models (Schaffernicht and Groesser 2011; Torres et al. 2017), as well as their "subjective interpretation" of the relevance given to a specific set of resources (Kunc and Morecroft 2010).

Specifically, the resource mapping clarifies how the management and governance actions eventually create value and impact on the organization's selected outcomes. Thus, the combined approach of <IR> and DRBV favors the identification of "Key Value Creation Spots (KVCS)" as resources or value outcomes affected by dense feedback processes that are controlled by the management of the organization or its stakeholders. Tables 3 and 4 offer the evidence to identify those KVCS.

Notably, from the organization's perspective the identification of KVCS is helpful to reveal managers' mental models and the dominant logic which governs decision-making and resource allocation. From the stakeholders' perspective, the identification of KVCS can help to explain not only the amount of governance actions involving that KVCS, but also the emphasis given by the organization's managers to the various stakeholders related to a certain KVCS. This could eventually clarify which KVCS are less considered and the trade-offs to be exploited to create value in a multi-stakeholders perspective (e.g., see our previous comment in Section 4 about the importance of managing the human resources). Overall, this is helpful in assigning to an <IR>-based resource map a role that goes beyond being a simple communication to stakeholders, to become a governance tool to be used with stakeholders.

6. Limitations and further research

Our contribution has some limitations. Firstly, it presents only two exploratory case studies, even though we believe they are relevant given the history of the two companies under the <IR> initiative. Additionally, having obtained similar results between the two resource maps offer confidence on the method. However, we will continue applying the enhanced framework to other similar firms (Oil&Gas and Basic Metals) in the <IR> initiative to confirm the suitability of our framework. Secondly, a possible limitation is related to our research design. We applied an external approach to resource mapping that implied and/or influenced some methodological choices and technical solutions. Particularly, consider that - although the maps were developed and later compared by the three researchers independently to reduce potential "researcher effects" (Miles et al. 2013) - it was not possible to validate them with the managers from the two companies and discuss with them the various steps and the results of the resource mapping process. As an example, we could not discuss the selection of the key resources, or the signs (the "polarities") assigned to the causal linkages included in the map, even in case where a certain degree of uncertainty was present. Subsequently, our future work will use focus groups with both set of actors (managers and stakeholders) not only to evaluate their opinions, but also to validate the resource maps and discuss with them technical aspects and details. Notably, it is authors' opinion that the focus groups should include both internal and external stakeholders in order to evaluate their capacity to implement such a complex process (i.e., the integration of <IR> and DRBV) and eventually favor the development of several resource maps (for the same organization) with a different level of aggregation and complexity depending on the specific aim (or interest) pursued. In this specific regard, a relevant role may be played by selected facilitators or specialists (typically academics) which will not only favor discussion and sense-making among the various stakeholders but also support the development in group model building workshops (Vennix 1996).

Last, we would like to underline that the main aim of this article is demonstrating qualitative resource maps, that could be converted into quantified mathematical models which can be simulated by modelers after further refinement, e.g. dimensional consistency. This definitely opens up avenues for future research in terms of using quantified simulation models and management flight simulators (Morecroft and Sterman 2000) to provide insights on the dynamics emerging in <IR>-related business domains together with evaluating the dynamic behavior of companies driven by the complex set of feedback loops through eigenvalue analysis (Kampmann and Oliva 2006).

7. Conclusion

Our paper contributed to offer a new methodology that improves the <IR> in terms of reducing causal ambiguity and explaining the dynamic complexity involved in the business in order to facilitate governance processes based on <IR>.

Overall, a combined approach of <IR> and DRBV has the potentials to support organizations in a comprehensively way, representing the fundamental architecture according to which the specific business system operates, being influenced by the network of interdependencies existing both within and outside the organization, and more importantly between the organization and its key stakeholders. This, as we have shown previously, may help to explain and explore trade-offs between capitals, visualize the KVCS, and explain clearly strategies aimed at introducing changes in resources that eventually affect the future of the organization and its various stakeholders.

In sum, a combined approach of <IR> and DRBV is able to move <IR> beyond the "simple" communication to the various organization's stakeholders of data and information about the business system in place and the organization's performance, into supporting decision-making of managers and combining integrated thinking and integrated management practices toward a "managing with stakeholders" approach.

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Appendix

Method to build resource maps from <IR>

The process of developing the resource maps follows the stages described below.

The first step entailed searching within the documents for key <IR>-related concepts (e.g., capitals, business model, value creation process, business activities, outputs and outcomes) and, more in detail, identifying the two organizations' capitals/resources, classified according to the indication of the <IR> framework (IIRC 2013a and 2013c). In our case, we reviewed in detail the four annual Integrated Reports (analyzed separately for SASOL and ENI), focusing on all sections of the reports explaining the two organizations' business model, value creation process and key performance indicators (KPIs); these three elements represent the fundamental concepts at the core of any integrated report. This step also entailed identifying and visually reviewing any representation, table or matrix related to the key guiding principles listed by the IIRC's framework (IIRC 2013a): strategic focus and future orientation; connectivity of information; stakeholder relationship; materiality; conciseness; reliability and completeness; consistency and comparability. The analysis in this phase of our research was conducted following the guidelines and suggestions provided by several contributions in the field of content analysis for qualitative research and, more specifically, when applied to sustainability and ESG-related reporting (Milne and Adler 1999; Guthrie et al. 2004; Guthrie and Abeysekera 2006). In broad terms, content analysis is "a research technique for the objective, systematic and quantitative description of the manifest content of communication" (Berelson 1952); moreover, content analysis is also "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff 2004, p. 21). Notably, the technique can be used with either qualitative or quantitative data (Elo and Kyngäs 2008, p. 107) and provides powerful support for researchers who aim to analyze large volumes of data in a systematic fashion with relative ease (Stemler 2001, p. 137). Therefore, content analysis allows organizing "the text of writing into various groups or categories based on selected criteria" (Guthrie et al. 2004, p. 287).

The second step of the process required exploring and treating the information retrieved according to a coding technique that involved, as suggested by Kim and Andersen (2012, p. 315), "discovering concepts and their relationships from raw data and iteratively working with the concepts and relationships to allow theories to emerge from the data". Specifically, we applied two (out of the three) typologies of coding suggested by Kim and Andersen (2012, pp. 315-316): first, open coding was used to break down data into smaller pieces-words, phrases, sentences and paragraphs and to define (sub)systems boundaries and identify key variables; secondly, *axial coding* was used to find relationships among the concepts, variables and codes previously identified. The objective of coding was to confirm linkages between the components of the resource maps as well as other components not related with resources such as external factors or activities.

Then, we proceeded to the next stage of our research process, using the software Vensim (Eberlein and Peterson 1992) to develop the resource map for each organization accordingly with the steps outlined below (see Table 1.A) (Kunc and Morecroft 2009; Kunc and O'Brien 2017).

Table 1.A. Methodology to develop a resource map for <IR>.

Resource mapping	1. Lay out the resources (boxes) 2. Identify the processes (flows) responsible for building or eroding resources 3. Identify capabilities 4. Portray relationships (direct and indirect) and polarities (positive and negative) 5. Include additional external or unmanageable effects 6. Identify feedback loops (reinforcing and balancing)

More details are provided below.

1. *Lay out the resources (boxes).* In order to identify resources in the integrated report, there is a set of questions: what are the capitals identified in the report? How is this capital built? Does the capital have a long-term life in the organization? Is this the basic unit of analysis or can we identify another accumulation process defining the capital? For example, "Chemical plants" (from SASOL's map) have a long-term life, are tangible and there is no other accumulation process. Notably, for all of the different categories of capitals (see IIRC 2013a), each report specified the name of the resources either owned or managed by the organization. Therefore, this allowed us to start building the *resource map*, beginning with the identification of the resources at the core of the two organizations' business models.

2. *Identify the processes (flows) responsible for building or eroding resources.* The information collected has to be codified in order to recognize and represent the processes causing the resource growth or decrease, i.e. inflows and outflows. For example, "New buildings and equipment" (from ENI's resource map) is an investment (inflow) increasing the resource "Buildings and other equipment", or "Investment" is an outflow reducing the organization's "Liquidity reserves", which is a resource.

As an example, Figure 1.A portrays the key resources and the main governance actions for SASOL, respectively visualizing the variables belonging to the "Manufactured capital" and the "Financial Capital" and their trade-offs and relationships. In terms of the flows between the resources of the manufactured capital, they can be associated with flows of energy between the different assets.

[FIGURE 1.A HERE]

Fig. 1.A SASOL's resource map based on the stocks of Manufactured capital and Financial capital as indicated in the organization's 2015 and 2016 integrated reports

Particularly, the simple map represented in Figure 1.A, identifies the SASOL's key stocks of capital (resources), main actions (flows), and also value creation outputs and outcomes for its stakeholders (concepts in red color). Different colors serve to make the resource map more intelligible. The names of the resources (rectangles) are aligned to the stocks of capital as indicated by the organization's integrated reports, and the names of the flows (arrows with little valves) indicate the processes responsible for accumulation and depletion of the resources (as identified in the previous steps). We applied the same method also to build an initial simple resource map for ENI.

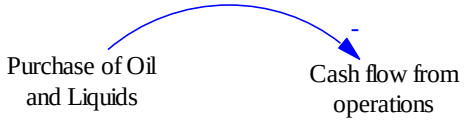
3. *Identify capabilities.* Capabilities originate from either a single resource or from a set of related resources. Capabilities can build other resources, generate value by attracting customers, or generate activities influencing external stakeholders. The questions to identify capabilities are: what processes originate from resources? Where this activity comes from? The capabilities discovered in the integrated reports are presented in the resource maps

using variables and not boxes[4]. For example, "Technology and patents" (resource) boost "Technological upgrade" (capability) which in turn sustains "Fracking" (flow) thus increasing "Hydrocarbon (gas) reserves" (resource) (see Figure 3).

4. *Portray relationships (direct and indirect) and polarities (positive and negative).*To design the resource map basing on the integrated report data, we also need to represent the causal links in the organization. They are depicted through the use of connectors (lines) which contain the direction of the linkage and the type of linkage, e.g. (from Figure 3), "Financial capital" (resource) generates new "Investments" (outflow) that sustain "Research and development expenditures" (inflow) that eventually develop "Technology and patents" (resource). The type of linkage indicates a positive impact - an increase in A increases B, or a negative one, - an increase in A decreases B. For example, "Investments" have a negative impact on "Financial capital" because "Investments" decrease initially the amount of "Financial capital". However, "Investments" have a positive impact on "Technology and patents" because they support "Research and Development expenditures", which generate patents. A critical aspect to consider is the evidence to uncover these relationships: a verbal description of the linkage (explicit) or an inference from existing data or comments in the report (implicit) through the content analysis process performed at the beginning.

See examples in Table 2.A, which also provides a rather general description of the concept of "polarity".

Table 2.A. Examples of causal relationships (from ENI's resource map).

Example of causal link with positive polarity	Example of causal link with negative polarity
	
The polarity "+" clarifies that an increase in "Investments" would lead (*ceteris paribus*) to an increase in "Exploration" activities. Similarly, a decrease in "Investments" would lead to a decrease in "Exploration" activities.	The polarity "-" clarifies that an increase in "Purchase of Oil and Liquids" would lead (*ceteris paribus*) to a decrease in "Cash flow from operations". Similarly, a decrease in "Purchase of Oil and Liquids" would lead to an increase in "Cash flow from operations".

Identifying causal relationships and defining the polarity to be assigned to the linkages were not always straightforward. To this aim, we relied on the information explicitly provided by the documents (e.g., maps describing business processes or verbal descriptions of the business activities) and on the coding technique applied in the previous step of the research design.

5. *Include additional external or unmanageable effects.* If the <IR> stresses the existence of further (external or unmanageable) events affecting the capitals, these events have to be included in the resource map, specifying the type of the effect produced (negative or positive).

6. *Identify feedback loops (reinforcing and balancing).* The resource mapping is finished with the identification of the feedback processes between resources and flows. A feedback process consists of a circular relationship between a set of concepts (or parts of a system), e.g. A affects B, then B affects C and ultimately C affects A

[4] Capabilities can be represented in System Dynamics models as stocks (for more details see Rahmandad 2012 and Rahmandad and Repenning 2016). However, we decided to represent capabilities not as a stock following literature in the RBV (see section 2.3.1). Additionally, the two organizations explicitly list some capabilities as variables and not resources (e.g., Process upgrade and Technological upgrade for the ENI's 2015 IR are referred to as "main actions" and not as capitals/resources).

determining a circular relationship between A-B-C. They are recognized and labelled as either reinforcing (positive, generating growth) or balancing (negative, inducing stagnation)[5]. This last step is also fundamental to explain trade-offs among resources/capitals, and correctly portraying value creation patterns, as emerged from the analysis of the integrated reports.

Subsequently, we analyzed the structure of feedback loops responsible for determining value creation patterns.

As example is provided by Figure 5, already presented in this study, which depicts two feedback loops identified in the ENI's resource map.

The first one, the positive (or reinforcing) feedback loop can be traced circularly as follows:

1) An increase in Brand & Reputation management (activities),
2) increases ENI brand + Reputation,
3) increases Customers and Suppliers Satisfaction,
4) increases Products delivered to market,
5) increases Availability of energy sources and green products,
6) increases stakeholders engagement + projects for local development + strategic partnership,
7) increases Relationship with stakeholders,
8) decreases Environmental and social impacts (blow-out risk, fight against corruption, wellness and satisfaction of ENI's people and local communities, ...) (*the polarity of this link is a "-"*), which in turn
9) increases Brand & Reputation management (activities), thus closing the feedback loop.

The second one, the negative (or balancing) feedback loop, connects the following variables:

1) An increase in stakeholders engagement + projects for local development + strategic partnership,
2) increases Relationship with stakeholders,
3) reduces Environmental and social impacts (blow-out risk, fight against corruption, wellness and satisfaction of ENI's people and local communities, ...),
4) which feedbacks to the starting variable, decreasing stakeholders engagement + projects for local development + strategic partnership, and closing the loop.

Notably, the analysis centered on the structure of feedback loops can be carried out extensively for any variable (resources, outcomes, and capabilities) in the map.

We also underline that the two resource maps were refined with the addition of a number of colored boxes, used to group together variables (either resources, flows or auxiliaries) pertaining to the same category as indicated by the IIRC Framework (IIRC 2013a and 2013c). These boxes can be considered sub-systems (see Sterman 2000, pp. 99-102 about the use of subsystem diagrams) and constitute the general architecture of the <IR>-based resource maps.

As an additional methodological note related to this study, we underline that data and information included in the <IR> under investigation were separately analyzed by each one of the three researchers involved in the research with the aim to reduce potential "researcher effects" (Miles et al. 2013, p. 296). The outputs of the three autonomous data processing were subsequently compared in order to derive the resource maps presented in this article. Notably, the resource maps we present in this article are <IR>-based ones: for this specific reason, we used the categorization of the capitals/resources in 6 main typologies (as presented in the section 2.2.) to group together "similar" resources, capabilities and flows within the maps.

[5] On defining the typology of feedback loops see what Sterman (2000, pp. 144-145) states: "The right way to determine the polarity of a loop is to trace the effect of a small change in one of the variables as it propagates around the loop. If the feedback effect reinforces the original change, it is a positive loop; if it opposes the original change, it is a negative loop. You can start with any variable in the loop; the result must be the same".

As mentioned in section 3 of this study, the last step of our research design entailed analyzing the resulting resource maps in terms of issues related to causal ambiguity and dynamic complexity in the business. To this aim, we employed SDM_Doc software (Martinez-Moyano 2012).

Notably, this last step allowed generating a number of descriptive statistics about the structure of the two resource maps, and identifying interesting information about the importance of each variables portrayed in the maps. Specifically, this stage allowed clarifying which are the *Key Value Creation Spots* for the two organizations, that is to say those resources or value outcomes affected by dense feedback processes that are controlled by the management of the organizations or their stakeholders. Tables 3 and 4 in the main body offer the evidence to identify those KVCS.