

Environmental and Sustainability Management Accounting Network



International Sustainability Accounting Symposium 2015 Measuring sustainability performance: bridging corporate and academic contributions

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Foreword

Redefining Value: The Need for Bridging Practitioners and Scholars

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World Business Council for Sustainable Development (WBCSD)

The period between 2010 and 2014 saw significant developments in the creation of sustainability reporting frameworks, standards and guidelines and the emergence of new methodologies to support business in measuring the impact and dependences of their interactions with environmental and societal externalities. Some of these developments were led by businesses such as the innovative Puma Environmental Profit and Loss Account whilst others were developed by non-governmental organizations (GRI, IIRC, SASB, CDSB, WRI, WBCSD but to name a few) consultancies and academics. In some parts of the world regulators and legislators also added to the mix by mandating businesses to disclose some aspects of sustainability performance or require business leaders to address salient sustainability issues in their operations and/or supply chains.

Businesses were the target users of these groundbreaking initiatives and many hoped that they would help address sustainability challenges whilst simplifying both process and perceived burden. Members of the World Business Council for Sustainable Development however did not agree that the ever growing landscape was helpful nor simplified and so in response to member concerns, the WBCSD met with its membership in Geneva in January 2014 to discuss the role that the WBCSD should play, if any, in the space of measuring, valuing and reporting business sustainability performance. This gave birth to the Redefining Value (RV) program, a flagship WBCSD initiative with the objective of accelerating the economic pathway of the WBCSD Vision 2050 and creating a world in which businesses can compete on performance not on methodology.

The RV Program is made up of six focus areas that in their early stages of development are standalone and discrete however it is clear that over time they become more and more interconnect and begin to merge forming a holistic and rounded support for business in measuring, valuing and reporting not just sustainability performance but business performance. This is based on the Vision 2050 objective of business being rewarded based on its true value creation based on business reporting its true revenues and costs and thus its true profit. RV envisages a world where by businesses are required to internalize and monetize externalities and account for this. To enable this we need robust and credible accounting methods that are embedded in Sustainable Generally Accepted Accounting Practices, seismic shifts in the corporate regulatory and governance environment and future proofed education for the businesses leaders, accountants, lawyer and investors of tomorrow.



Central to the RV program is the need for accelerated education, capacity building and exchange in a collaborative and synergistic way. This was the driver for WBCSD, together with EMAN, to jointly hold an Academic/Business symposium calling for research from practitioners and scholars on the topics

- Research papers examining the application of sustainability measurement concepts in corporate practice;
- Approaches developed to support the application of academic sustainability measurement methods in corporate practice;
- Evaluation of implementation experiences by consultants through research on the experiences of implementing sustainability performance measurement methods in corporate practice; and,
- Practitioner - academic reports.

48 extended abstracts were selected from 34 submissions and the symposium took place in Geneva on 1st and 2nd October 2015. The selected abstracts are presented here in this volume.

I would like to thank the academic and practitioners who took the time to take to submit an extended abstract and for making the time to come to Geneva and for their excellent contribution. I would also like to extend my deepest thanks to the Chair and Board of EMAN and to Prof. Dr. Gail Whiteman (WBCSD's Professor in Residence) for their encouragement and support.

Dr. Rodney Irwin

Foreword

Contributions to Sustainability

What Kind of Information is Needed?

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Thank you for your interest in the first joint symposium of the WBCSD and EMAN. The aim of the symposium was to facilitate intense discussions and the exchange between practitioners and academics on content, scope, methods and addressees of measuring corporate sustainability performance. No doubt, corporate management is a crucial actor in shaping the future development. Wrong management decisions neglecting social and environmental issues impede the whole corporate organization from improving in sustainability terms. We could thus expect that not just practitioners but also academics give this topic a priority. The opposite, however, can often be observed in academia and practice. The engagement of the WBCSD to bring the topic onto the agenda and to collaboratively work with EMAN to increase knowledge is thus welcome and I would like to thank Dr Rodney Irwin and his WBCSD team for their engagement with EMAN.

In order to create corporate sustainability and as a precondition to an active and beneficial role of companies for sustainable development, management depends on relevant and reliable sustainability information about social, environmental and economic issues as well as about the links between these dimensions. Corporate sustainability includes both, the sustainable development of the organization itself as well as the role of the company as an actor for a sustainable development of the economy and society as a whole.

Conventional accounting as the core corporate information system for management does not provide the necessary relevant information to take the decisions which support sustainable development. Methodological developments are thus needed. In essence, the necessary contributions performance measurement and accounting have to make to fulfil their roles have to be derived from the concepts of sustainable development and corporate sustainability. This includes partial views and considerations such as the measurement of social issues, eco-efficiency developments or specific improvements in material flow reductions, etc. However, if performance measurement is stuck with partial considerations management remains a rag rug with more or less large holes. Thus, the links between the dimensions of sustainability and challenges of the integration into conventional information systems become key factors to any improvement strategy.



Given the aim of creating companies which do not just optimize their organization but which in addition attempt to improve the social and economic development towards more sustainability, sustainability accounting also has to consider issues which can only be identified and dealt with through stakeholder dialogues and participation. Sustainability accounting is thus not just a challenge of a company-internal choice of the right information but also a challenge of creating new participation processes which enable management to co-create sustainable development.

Prof. Dr. Stefan Schaltegger

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Sustainable Portfolio Management (SPM) approach at Solvay to decision making and strategy development

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Abstract: This paper focuses on a Sustainable Portfolio Management (SPM) approach that Solvay developed to support decision making and inform strategic direction. The tool is integrated into the Solvay Way Framework and serves as a vehicle to measure the maturity of sustainable business practices. Since its development in 2009, the SPM profile has been integral part of the strategic discussions of each of the group’s Global Business Units (GBU’s) with the Executive Committee. Investment decisions (Capex or M&A) taken by the Executive Committee or the Board of Directors are also informed by the use of this tool. The results have been very encouraging and Solvay is now ready to open up the methodology as an open source tool for others to use.

I. Introduction

Solvay sets itself the objective of progressively transforming its portfolio, notably by growing its revenue in sustainable solutions sought in the marketplace and therefore allocates the vast majority of its resources to even more sustainable developments (internal and external growths).

In order to deliver this very ambitious vision, well- informed and balanced decisions need to be made regarding resource allocation and balancing the business portfolio. This is the raison d’être of the SPM (Sustainable Portfolio Management) methodology helping decision makers when making their judgments, taking into account the sustainability megatrends that may positively or negatively affect Solvay’s top and bottom lines.

II. Methodology

The SPM methodology was designed in-house in 2009 and developed further with the support of two recognized consultancies, Arthur D.Little and TNO. It has been continuously improved since 2009 in order to make SPM evaluations at Product-Application Combinations (PACs) level more pertinent and reliable. The operations vulnerability (vertical axis) indicator evaluates any potential financial risk posed by the “polluter pays for the damage” megatrend. The basic evaluation begins with a classic Eco profile calculation (ISO 14040 to 44). The environmental impacts are monetized, summed up and evaluated against the average sales price for that product in that application (the intent is to reflect sustainable development issues and not short-term market prices effects).

The market alignment (horizontal axis) indicator addresses the sustainability megatrends in the marketplace i.e. do we anticipate double-digit growth for this product because it is an active part of the sustainable solution that the market, the consumers or the brand owners, demands.

The assessment is made at the Product-Application Combination (PAC) level, using a detailed and precise questionnaire and is supported by external authoritative evidences

- Star: PAC for which there are no negative but positive signals, in line with sustainability trends in the marketplace, with anticipated double-digit growth;
- Aligned: PAC for which there are no negative but positive signals resulting from sustainability trends in the marketplace, without anticipated double-digit growth;
- Neutral: PAC for which there are neither positive nor negative signals resulting from sustainability trends in the marketplace;
- Exposed: PAC for which there are weak negative signals resulting from sustainability trends in the marketplace;
- Challenged: PAC for which there are strong negative signals resulting from sustainability trends in the marketplace.

To be classified as “Star” or “Aligned”, products must serve a use that demonstrates a direct, significant and measurable benefit to the market, impacting positively upon at least one of the sustainability benefits below. If a sustainability roadblock is identified, then the Product Application Combination will be classified as “Challenged” or “Exposed”.

Essential living conditions	Living Well
Climate Change	Medical care
Energy efficiency	Chronic diseases
Exposure to harmful and toxic substances	Limitation of the effects of aging
Resource efficiency	Medical care at home
Fresh water	Water & air quality
Renewable materials	Safety & prevention
Availability of food	Healthy nutrition
Renewable energy	Healthy habits
Biodegradability T	optical care
Recyclability	
Waste treatment	
Minimizing use of scarce inputs	

Legend: List of the SPM benefits

The above list has been set up by:

1. Identifying authoritative “think-tanks” on the subject: Rocky Mountain institute, World Watch Institute, WWF, Greenpeace, UNEP, Wuppertal Institute, WBCSD, International Institute for Sustainable Development, London School of Economics, Sierra Club, Öko Institut;
2. Comprehensively listing the sustainability topics that matter to them;
3. Selecting the topics for which a chemicals might be part of the solutions or the problems.

The list has continuously been improved over years to mirror the latest progresses in corporate social responsibility.

III. Ownership and governance

The SPM methodology is owned by the Corporate Sustainable Development Function and managed by a small team of experts. It thus serves as a strategic tool to develop the information that is required to anticipate the impacts of potential decisions on the sustainability profile of the Group:

- the SPM methodology is integrated into the Solvay Way framework and serves as a tool to measure maturity of organizations with regard to the integration of sustainability in business practices (three commitments and seven practices);
- the SPM profile is an integral part of the strategic discussions of each of the Global Business Units (GBUs) with the Executive Committee (Comex);
- the decisions about investments (capital expenditure and acquisitions) taken by the Comex or the Board of Directors include a sustainability challenge that encompasses an exhaustive SPM analysis of the contemplated investment;
- the SPM work plan is discussed each year between each GBU and the Sustainable Development Function. Priorities and workloads are defined based on the results of the SPM evaluation of the previous year and including any new elements in the marketplace, regulations, etc. The evaluations are carefully prepared in close consultation with the Solvay Way Champion of the GBU and realized in workshops with GBU experts: strategy, industrial, product stewardship, marketing and technical services.

IV. Findings

An in-depth verification of the “Market Alignment” results covering 144 Product-Applications Combinations (PACs) is currently carried out by Arthur

D. Little. To date, 94 PACs evaluations were confirmed by Arthur D. Little, 4 PACs were not confirmed and Solvay endorsed Arthur D. Little score (2 with a better scoring and 2 with a lower scoring). 46 PACs are still in revision process.

Until recently, Solvay kept the SPM methodology in-house. The Group now believes that there is significant value for other companies, in further improving the methodology through having it challenged by other companies, and in creating consistent benchmarks. Arthur D. Little is Solvay’s partner in making the methodology available to interested parties.

To date, 85% of the Solvay group’s sales has been assessed from a market alignment perspective, which is ahead of schedule and exceeds the 2015 objective.

Solvay’s target is to achieve 20% of revenue with Product Application Combinations in the Star category, i.e. in markets expected to experience double-digit growth for sustainability reasons. The initial results have been encouraging. The assessed portfolio encompasses 24% of Product- Application Combinations in the “Aligned” category and 7% in the “Star” one, both in progress compared to previous year.

Together, this 31% in 2014 (up from 8% vs. previous year) of revenue represents “Product-Application Combinations” matching stakeholders sustainability expectations. The share of the sales in SPM Star category is continuously increasing and we feel confident of delivering the ambitious 2020 objective.

V. Conclusion

Solvay’s target is to achieve 20% of revenue with Product Application Combinations in markets expected to experience double-digit growth for sustainability reasons (SPM Star category). The initial results have been encouraging. The assessed portfolio encompasses 24% of Product-Application Combinations in the “Aligned” category and 7% in the “Star” one, both in progress compared to previous year.

Together, this 31% in 2014 (up from 8% vs. previous year) of revenue represents “Product-Application Combinations” matching stakeholders sustainability expectations. The share of the sales in SPM Star category is continuously increasing and we feel confident of delivering the ambitious 2020 objective.

Net impact accounting and reporting in the mining sector: Bridging the gap between discourse and disclosed information in South Africa

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Abstract: How do reporting organisations disclose their net environmental and social impacts? The analysis of the sustainability reports of selected South African mining companies over a 10-year period shows a blurred picture. No information about their net environmental or social impacts over time is clearly disclosed, contrary to what their financial statements do with respect to their financial performance. Indeed, financial, sustainability, externality and integrated reporting do not have the same accounting principles and foundations. This paper thus highlights the importance of developing time and spatially relevant accounting principles for social and environmental impacts, using complementary values, so to be able to clearly convey the net contribution of mining to society.

I. Introduction

What does inclusive, sustainable development mean from the perspective of private companies? For instance, are the numerous “sustainability awards” received by mining companies and the associated discourses actually matched by tangible outcomes, on the ground, for employees, local communities, the natural environment and the South African nation as a whole?

II. Aims & methods

This paper aims to discuss how reporting organisations account for their net financial, social and environmental impacts and propose possible pathways to improve sustainability performance disclosure and accountability. First, we introduce and critically analyse the various methodological approaches to account for and report on the net contribution of organisations to society, from a financial, sustainability, externality and integrated perspective. This leads us to highlight the accounting gaps between financial accounting standards and the other forms of reporting^[1]. To illustrate the main gap identified, we use selected case studies of South African mining companies. This involved tracking several Key Performance Indicators (KPI) across all the sustainability reports over a 10 year period.

III. Key results: current sustainability reporting does not support the

DISCLOSURE OF NET CORPORATE PERFORMANCE OVER TIME

On the one hand, financial accounting and reporting models are based on double entry accrual accounting rules which help companies generate space and time- relevant results of financial performance. On the other hands, the others form of reporting are limited to annual KPI, with often no baseline information to understand net impacts over time, in other words the net sum of positive and negative ones over a given timeframe.

This is illustrated by the three mining case studies which fail to disclose their net social or environmental impact over the 10-year period of analysis. Reporting discourses focus on annual improvements or management systems, with no data on the actual impacts on communities and ecosystems over the life cycle of the mines, from initial planning until closure.

IV. Making of use of net natural capital impact principles

We argue that this status quo is due to the fact that current non-financial reporting guidelines (e.g. Global Reporting Initiative Guidelines 4) focus the attention of the reporting organisation and its stakeholders exclusively on the identification and management of material issues, which unavoidably shift over time and space, according to changes in business priority or perceived stakeholder interest(s). By failing to provide clear, comprehensive double-entry accounting guidelines for critical sustainability-related information, reporting organisations cannot tell the whole story and end up highlighting only a selection of their corporate sustainability performance.

However, several methodologies are available to strengthen current sustainability reporting guidelines. For instance, methods which assess the net biophysical environmental impacts of projects (e.g. biotopes, populations of specific species)^{[1],[2]} and those which use economic valuation

methods to assess the net economic impacts of projects / companies (inclusive of social and environmental externalities ; e.g. ^[3]_[4]^[5]) can help improve sustainability and integrated accounting and reporting practices. To that end, one cannot over- emphasize the importance of disclosing the whole “value chain” of information useful for decision-making, including financial information (e.g. expenses, revenues, assets, liabilities), sustainability metrics (e.g. net water, carbon and biodiversity footprints) and externality values (e.g. costs to local communities) ^[1].

V. Conclusion

We conclude by making recommendations on how corporate accounting, reporting, auditing and monitoring could evolve in the future so as to generate the information needed by all stakeholders to better understand how organisations create and share value and whether they generate the (often claimed) net positive impacts on specific stakeholder groups and society in general.

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Bridging the gap between business and nature: Introducing the Natural Capital Protocol

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I. What is natural capital, and why is it relevant?

Our world is rooted in an economic system of spending and saving. We minimise risk and maximise opportunities based on the information we have about our financial environment.

But financial capital is only one part of a much bigger picture. Economic activity also depends on the planet's natural capital; defined as the stock of natural resources from which people can derive benefits. It's a stock that we consume, manipulate, invest and save just as we do our financial assets, and yet we don't account for or manage this expenditure at all. There is no natural capital balance sheet.

We now know that the global economy is no longer operating within safe boundaries ^[1]. Natural capital is being depleted at a rate of 50 percent more per year than the earth can replenish, and this rate of depletion is accelerating ^[2]. For business, the unaccounted loss of natural capital can create significant unmanaged risks in supply chains that threaten the stability of operations and future cash flows.

Now is the time for business and society to recognise the importance of natural capital. Whether we like it or not, measuring, valuing and ultimately accounting for and reporting on natural capital has the potential to change mainstream economics and revolutionize the way the world works.

II. What is the natural capital protocol?

The Natural Capital Coalition is a global platform which brings together the different initiatives and organizations working in natural capital under a common vision of "a world where business conserves and enhances natural capital".

The Coalition has brought together the world's leading stakeholders from business, science, academia, policy, accountancy, consultancy, finance, civil society and not-for profit to develop the Natural Capital Protocol (NCP); a standardised framework for businesses to measure and value their direct and indirect impacts (positive and negative) and dependencies on natural capital.

The Protocol will make the measurement and valuation of natural capital more accessible for business, with the primary focus to improve internal decision making. It will set out clear steps and guidance on the technical process and on the way the outputs can be used, as well as suggestions about how to embed natural capital measurement and valuation into core business culture.

It is a priority to ensure that the Protocol will work across multiple business contexts, geographies and applications. It will be further supported by additional sector-specific guidance on common complexities and issues.

Business will remain heavily engaged throughout the development process to ensure the final framework is relevant, accessible and practical. This includes regular opportunities for engagement and feedback, plus opportunities to pilot test the framework as it evolves.

The Protocol also intends to build on those methods that already exist, and a number of proprietary and public methodologies have already been considered and leveraged in the writing process.

III. Inclusive approach

Business will remain heavily engaged throughout the development process to ensure the final framework is relevant, accessible and practical. This includes regular opportunities for engagement and feedback, plus opportunities to pilot test the framework as it evolves.

The Protocol also intends to build on those methods that already exist, and a number of proprietary and public methodologies have already been considered and leveraged in the writing process

IV. What can the protocol achieve?

The Natural Capital Protocol has the potential to completely transform the way that we view our relationship with nature, truly shifting behaviour towards conserving and enhancing the capital that defines true value for businesses and society. Nevertheless, this is not an easy process and a number of difficult questions need to be addressed, for example:

A. How will the Protocol help to value nature?

Valuation includes any expression of importance or worth; this may be monetary or non-monetary. Monetization offers a common unit with which natural capital becomes more easily comparable and transferrable into economic decisions. However, there are still challenges and in some cases, monetization may not be the most appropriate option, for example when considering the existence value of a species or the cultural value of a landscape. The NCP will therefore offer guidance on how to pursue monetization if desired, but will also cover other methods of valuation.

B. How does the Protocol relate to natural capital accounting?

Natural capital accounting is the process of systematically recording a business' natural capital impacts and dependencies, assets and liabilities in a consistent and comparable way, much like a financial balance sheet. Accounting for nature in this way is still an evolving field. The immediate purpose for the NCP is to help businesses build a foundation of understanding, to measure and value their natural capital, for which natural capital accounting may be one application. The NCP is a step along the path towards more integrated accounting but will not prematurely push companies towards this end.

C. How does the Protocol relate to external reporting?

The NCP focuses primarily on improving business' internal decision-making. However, companies may also choose to apply the NCP's standardized approach to measurement and valuation of impacts and dependencies for reporting purposes. It is anticipated that the NCP could influence and inform future standards.

Conclusion

The Natural Capital Protocol is unprecedented and ambitious. For the first time a wealth of specialists have been brought together to collaborate on a harmonized, universally accepted approach. We look forward to discussing where this project will take us.

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Environmental Management Accounting and Life Cycle Assessment – separate worlds with a strong potential to team up for measuring corporate sustainability performance

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Abstract: This contribution explores the links between Environmental Management Accounting and Life Cycle Assessments with the aim to identify the potential of improving the measuring of corporate sustainability performance

I. Environmental management accounting

Environmental Management Accounting (EMA) has been developed during the last 20 years to overcome the limits of traditional financial and cost accounting approaches to reflect companies' efforts towards sustainability. It also helps to provide management with information required to take decisions towards more sustainable business developments by reducing environmental impacts or generating environmental benefits (Jasch 2009).

EMA aims at supporting internal decision-making. The information provided by EMA includes quantified physical data for material and energy use, flows of intermediate goods, waste streams, emissions and monetized data for costs, potential savings related to the physical quantities.

EMA data are considered to support Environmental Management Systems according to ISO 14001:2004 (ISO, 2004), especially with regard to improvement targets and internal performance tracking.

II. Life cycle assessment

Life Cycle Assessment (LCA) takes a product and life cycle perspective; its use can be intended for internal decision-making such as EMA or for comparative assertion to publicly state the environmental performance comparing several products with the same function.

LCA is a technique to assess resource consumption and potential environmental impacts associated with a product, process, or service, by compiling an inventory of relevant energy and material inputs and releases to the environment. According to ISO 14040:2006 (ISO 2006a) and ISO 14044:2006 (ISO 2006b), LCA assesses a product system over its entire life cycle ranging from raw material acquisition

and materials manufacture, via production and use to waste management. Considerable efforts are underway to build global life cycle knowledge and capacity for understanding, developing, and promoting more sustainable products and services.

One key effort is to increase the availability of foundational data on energy and materials consumption and on related emissions. This comprehensive information is obtained by the use of LCA and stored in LCA databases (Sonnemann and Vigon 2011) that have proliferated mostly in Northeast Asia, North America, and Western Europe. Due to the interconnectedness of our global economy where products and services are sourced from many countries around the world, a coordinated global effort to define and produce high-quality LCA data is needed. Only with widespread availability of LCA information society will be able to make decisions on sustainable design options.

III. Environmental management accounting and life cycle assessment: recent

DEVELOPMENTS

Taking into account the internal character of the use of Environmental Management Accounting, the focus on monetary information and the given system boundaries of accounting for one organization, the approaches of EMA and Life Cycle Assessment seem to be very different. However, they may be linked, in the future, as both require interrelated, quantified physical data. Recent developments show that EMA and LCA are getting closer together.

Developed originally as a product- or process-oriented approach (ISO 14040 and ISO 14044) corporations start to apply the concept of LCA to assess organization's environmental impacts, which now is also possible according to the new guidance document ISO/TS 14072:2014 on LCA of Organizations (ISO 2014).

Moreover, the standard ISO 14001 for Environmental Management Systems is currently under revision and a new requirement has been added to take a life cycle perspective when assessing the environmental relevance of the company's activities. Environmental Management Systems have been undergoing a development not only reflected in a revised management standard, but also in corporate practice. Corporate sustainability management is the holistic approach to take into account environmental, social and economic aspects. Establishing social standards in the supply chain requires companies to go far beyond their corporate boundaries as society expects corporations to take responsibility for social and environmental impacts caused along their entire supply chains. Measuring sustainability performance thus is not limited to the system boundaries of one organization, but requires a life cycle perspective.

IV. Material flow cost accounting and life cycle assessment: common focus on supply

CHAINS

Among the EMA tools the method Material Flow Cost Accounting (MFCA) is specifically applied to detect inefficiencies in production systems by quantifying the true costs of wastage and inefficiencies in product systems. As an internal method, MFCA is a material and energy flow oriented accounting approach, which is used within an environmental management accounting framework in line with ISO 14051:2011 (ISO 2011). Material and energy flow oriented cost accounting approaches focus on the corporate material and energy flows as cost objects. The reasons for this are that firstly environmental impacts of a corporation are directly related to material and energy use and secondly – at least in the context of producing industry – energy and especially material consumption cause the highest portion of the manufacturing costs of a company. Therefore, material and energy flows are of high importance from two perspectives: their reduction is a joint environmental and economic target (Prox 2015). Investigating the technical reasons for losses during the application of MFCA with high cost or environmental impacts, practitioners often find that a loss occurring internally is caused by a property of the material that is influenced by the supplier or by a demand of a property for the final product that comes from a customer (Viere et al. 2007 and METI 2010). Therefore MFCA has been extended to be used in the supply chain in practice and an additional ISO standard (ISO/CD 14052) for the extension of MFCA to the supply chain is under development (ISO 2015).

Due to the common focus on supply chains, there are possibilities for integrating LCA data with MFCA analysis (Möller and Prox 2008), in particular with regards to information sharing since both tools have similar data needs. While LCA is focusing more on the environmental impacts, MCFA is able to serve as motivation for cost reduction initiatives. LCA data and databases can provide information for MCFA to express the resource losses in monetary values and increase transparency of material and energy flows and the respective costs. It thus can help to enhance an organization's sustainability performance by enabling better-informed decision-making in areas such as process engineering, product design and supply chain management (Sonnemann 2015).

V. Conclusions and perspectives

Typically Life Cycle Assessment is used and understood as a tool to support decision-making for the improvement of products while addressing the whole life cycle and accounting for resource consumption as well as emissions and waste flows to determine environmental impacts as well as technical and economic performance. The common base of EMA and LCA is the need of physical data on the production system. The demand for taking a life cycle perspective while assessing the environmental relevance of all activities of a corporation is increasing, thus LCA provides a systematic approach to assess environmental impacts caused by the use of resources and the release of emissions and waste to nature. EMA and LCA have been developed in different scientific communities, with only limited exchange in the past. EMA methods have been elaborated by accountants, while LCA methods have been developed by engineers and natural scientists. However, there is a strong potential to team up for measuring corporate sustainability performance. The recently established Forum for Sustainability through Life Cycle Innovation (FSLCI), as a life cycle community organization, stands ready to explore opportunities so that life cycle information can be applied more efficiently in sustainability accounting. To this end experiences and insights shared at the forthcoming workshop on "The role of Life Cycle approaches in management accounting", which will be hosted by the FSLCI in September in Bordeaux, France (FSLCI 2015), could provide a valuable addition to the discussions that are expected to take place at the WBCSD and EMAN joint International Sustainability Accounting Conference.

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Social Capital and Decision-Making: How social information can drive better business

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In June 2015, the World Business Council for Sustainable Development (WBCSD) launched a call for collaboration [1] to develop a Social Capital Protocol – a harmonized approach for businesses to measure and value their interactions with society. The paper outlines the need for action, introduces the Council’s use of the term Social Capital, and identifies the components needed within a Protocol. It highlights the significant advances companies are making in the field of measurement and valuation, featuring examples from several members of the Council.

With this paper, produced in collaboration between the WBCSD and KPMG, we aim to lay the foundations for the development of the Social Capital Protocol. Starting the journey towards this harmonized approach requires a new, more integrated way of thinking about how business impacts and depends upon people and society. We have drawn upon in-depth conversations with companies and experts to bring the concept of social capital to life. Most importantly, we seek to clarify the value of social capital information for business decision-making.

In Section I, we introduce the key concepts you will encounter throughout this work and clarify the connection between social capital and business value.

In Section II we take the perspective of the decision-maker to illustrate how social capital information can be used to understand, demonstrate and manage business performance.

In Section III we draw on the experiences of pioneering companies to illustrate how measuring and valuing social capital is already informing the decisions and actions of their stakeholders, leadership and managers.

In Section IV we provide pragmatic guidance to help companies ensure their measurement and valuation efforts are contributing to better decision-making and driving value creation for both society and the business.

Finally, in Section V we share our plans going forward and how the insights shared here will lay the conceptual foundations for the Social Capital Protocol as a basis for moving towards a harmonized approach to social capital measurement and management.

Concepts that you will encounter throughout this paper:

- Social capital
- Social capital impacts
- Social capital dependencies
- Business value-drivers
- Measurement
- Valuation

I. Social capital and why it matters

At the WBCSD and at KPMG, we see a common need emerging in the questions we receive from member companies and clients. Human resources professionals are asking how to cultivate their talent pool. Community investment managers are asking how best to build local relationships and support local development. Procurement managers are trying to influence the social performance of their suppliers. Product development, sales and marketing teams are working to create greater value for customers to drive loyalty and growth in the marketplace. Business leadership – up to the C-suite and Board of Directors – want to understand the social value created by their companies and the risks and opportunities of social performance.

What do we mean by social capital?[2]

A broad variety of concepts are currently being used to describe the interactions between business and society. The WBCSD is using ‘social capital’, to refer to the resources and relationships provided by people and society. This encompasses human capital (people’s skills, knowledge and wellbeing), social capital (societies’ shared values, norms and institutions) and relationship capital (connections and networks).

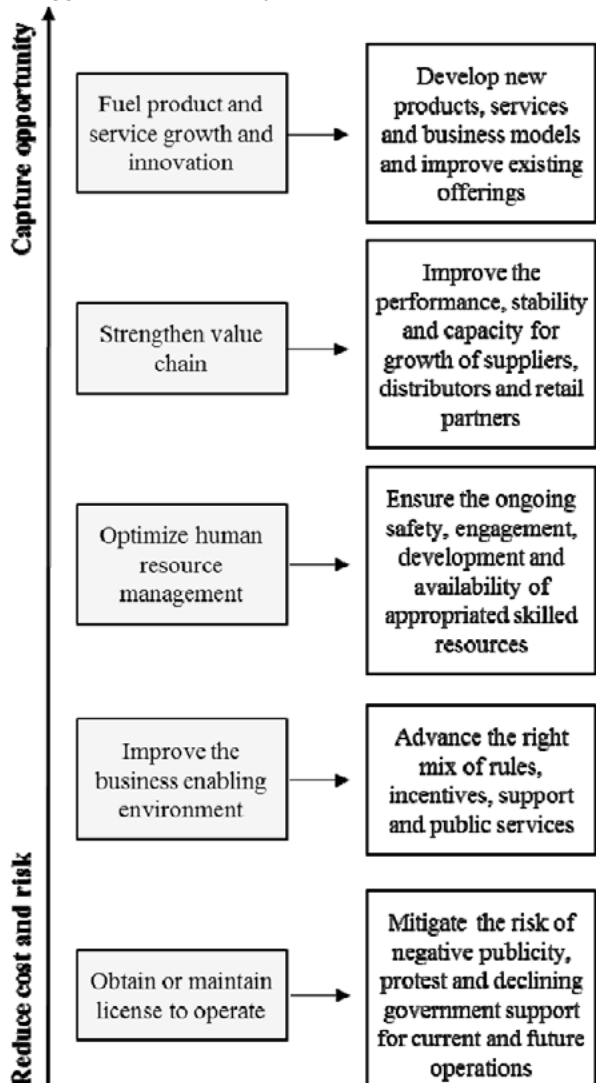
Together, these resources need to be maintained and enhanced to make society more cohesive and resilient, and to make business more successful.

Combining these concepts into a single term facilitates the consideration of the stocks and flows of social capital alongside financial and natural capital. Critically, this definition goes beyond the measurement of social impact to also consider the ways in which business depends on people and society. This will help companies to understand how social capital relates to their business drivers and how its effective management underpins sustainable performance.

As this work progresses, we will continue to develop the concept of social capital for practical use by companies and their stakeholders.

Through conversations with members, we have found that social capital affects business performance through five primary value drivers which reduce cost and risk or capture opportunities for a company, as illustrated in Figure 1.

FIGURE 1: THE BUSINESS VALUE-DRIVERS FOR SOCIAL CAPITAL MEASUREMENT AND MANAGEMENT



To contribute to each of these five value drivers, business is seeking to improve two types of social capital – both to sustain current performance and to lay the foundations for continued growth in the future:

1 Social capital dependencies – the human and social resources and relationships that are needed by business in order to deliver value. These can directly impact a company’s ability to operate and grow, and are of primary interest to business leaders and managers, as well as investors.

2 Social capital impacts – the positive and negative effects that businesses have on people and society through their operations and supply chains, and through the products and services they provide. These drive business value indirectly by influencing the perceptions, decisions and actions of a company’s external stakeholders such as governments, policy makers, civil society, communities, customers, suppliers and distributors, and current or potential employees. These stakeholders are often responsible for availability and access to a company’s social capital dependencies.

Table 1 provides examples of social capital impacts and dependencies that can affect each of the business value drivers.

TABLE 1: HOW SOCIAL CAPITAL IMPACTS AND DEPENDENCIES

	Examples of Relevant So-Cial Capital Dependencies	Examples of Relevant So-Cial Capital Impacts
Business Value Drivers	Of primary interest to business leader-ship, management and investors	Of primary interest to: governments, civil society, com-munities, current and potential em-ployees, suppliers, distributors and customers
Obtain or maintain licence to operate	Community, NGO and government acceptance	Human rights, wellbeing, liveli-hoods and job cre-ation, local spend, tax
Improve the business enabling environment	Supportive regulatory framework, infrastructure, access to resources	
Optimize resource management	Employee engage-ment and loyalty, access to a skilled talent pool	Fair wages, decent jobs, health and safety, education, training and skills development, com-munity contri-butions
Strengthen value chains	Suppli-er/distributor loyalty, quality and volume, compli-ance	Fair pricing and conditions, supplier/ distributors development, sup-port of financial, social and envi-ronmental performance of suppliers/distributors
Fuel product and service growth and innovation	Customer interest and loyalty	Impact of products consumption/ service use (e.g. nutrition, connectivity, accessibility), impact value chain (e.g. local jobs, fair wages, tax, human rights, community impacts)

NOTE: THIS TABLE IS ILLUSTRATIVE AND IS NOT INTENDED TO BE EXHAUSTIVE.

II. Using social capital information: the decision-makers' perspective

Within WBCSD, we see the use of social capital information for decision-making as a critical prerequisite for driving value for both business and society. Internal and external stakeholders with an interest in a company's social capital impacts and dependencies are key decision-makers whose chosen course of action can have a significant influence on a company's success. Providing these decision-makers with the right information is essential in order to integrate relevant social considerations into business thinking and action.

In conversations with WBCSD members, we have found that the selection of measurement and valuation approaches by leading companies is rooted in the perspectives and interests of these internal and external decision-makers – and we have seen a pattern emerging.

In a simplified form, social capital information is being used by key internal and external decision-makers in order to:

- Understand and demonstrate a company's social capital impacts and/or dependencies.
- Manage a company's social capital impacts and/or dependencies

TABLE 2: PRIMARY USERS AND USES OF SOCIAL CAPITAL INFORMATION

	UNDERSTAND AND DEMON-STRATE	MANAGE
SOCIAL CAPITAL DEPENDENCIES	<p>3 EXECUTIVE-LEVEL AND INVESTORS</p> <p>To inform high-level strategic direc-tion and budget and resource allocation decisions</p>	<p>4 MANAGERS</p> <p>To inform decisions that steer social capital dependencies at geography, department, project, portfolio or product levels</p>
SOCIAL CAPITAL IMPACTS	<p>1 EXTERNAL STAKEHOLDERS</p> <p>to inform decisions on whether to support or obstruct the company's success</p>	<p>2 MANAGERS</p> <p>to inform decisions that steer social capital im-pacts at geography, department, project, portfolio or product levels</p>

Taking the perspectives and interests of the decisionmaker into consideration can provide a structure by which to identify the most appropriate measurement and valuation techniques.

WHAT DO WE MEAN BY MEASURING AND VALUING?

Measurement: By measurement we mean the collection of qualitative or quantitative data. For some audiences, efforts may not need to go beyond measurement –KPIs describing a situation or results may provide sufficient information to inform communications and steer decisions.

Valuation:Valuation is the practice of attributing a common value to a diverse set of measures, in order to compare or aggregate them. We see companies using two main types of valuation:

- Scoring and rating systems – the practice of attributing scores or scales to social capital performance, e.g. Corporate or portfolio level rating systems and product life cycle scoring systems.

A. Understand and demonstrate social capital impacts:

The majority of companies we spoke began their social capital measurement journey by building an initial perspective of how a company interacts with society and identifying important areas for a company and its stakeholders to consider. The information is primarily used to inform the decisions of external stakeholders such as governments, civil society, communities, current and potential employees, suppliers, distributors, consumers and customers. For example, whether it is a legal obligation or not, information about the social capital impacts of a company can help governments decide whether to grant permits, provide supportive policies, or invest in complementary infrastructure.

Measurement: Companies are gathering rigorous qualitative and quantitative KPIs to influence the decisions of external stakeholders.

Valuation: Rating systems are used to aggregate the KPIs gathered and demonstrate overall performance, for example through corporate level scorecards. Some companies are beginning to monetize these impacts to demonstrate economic contributions or social return on investment, but this is not yet common practice.

TABLE 3:

VALUE DRIVER	KEY DECISION MAKERS	ILLUSTRATIVE DECISIONS
OBTAIN OR MAINTAIN LICENCE TO OPERATE	Government authorities	Whether to grant permits or access to resources
	Communities and NGO's	Whether to accept or protest against the company's presence
IMPROVE THE BUSINESS ENABLING ENVIRONMENT	Polymakers	How the design regulatory reforms and taxation mechanisms; Whether to invest in infrastructure and what kind
OPTIMIZE RESOURCE MANAGEMENT	Current and potential employees	Whether to work or continue working for the company
	Suppliers and distributors	Whether to supply or distribute for the company; What social performance standards to deliver
FUEL PRODUCT AND SERVICE GROWTH AND INNOVATION	Customer and consumers	Whether to buy or recommend products and services from the company

Manage social capital impacts

Many companies are now moving towards using the social capital information gathered in order to actively manage their social capital impacts in relevant areas. This lends further credibility to external communications and increases companies’ control over the effects of social capital impacts on their business. Measurement is used to provide internal decision-makers at manager level with the information they need in order to ensure their activities are delivering improved social capital impacts.

Measurement: Qualitative and quantitative KPIs [along the ‘results chain’ (insert footnote to guide) to provide leading indicators as well as long-term ‘impact’ indicators.

Valuation: Rating systems or performance scorecards are being used to understand and compare performance at country or product portfolio levels.

TABLE 4:

VALUE DRIVER	KEY DECISION MAKERS	ILLUSTRATIVE DECISIONS
OBTAIN OR MAINTAIN LICENCE TO OPERATE	Country or regional managers, external relations, corporate social responsibility	How much to source locally; how many local people to employ; Where to focus social or community investment programs
IMPROVE THE BUSINESS ENABLING ENVIRONMENT		
OPTIMIZE RESOURCE MANAGEMENT	Human resource management	How best to design HR policies e.g. health and safety, salaries and wages or training; How to develop and source the best talent; Whether and how to create and staff local jobs
STRENGTHEN VALUE CHAINS	Procurement and sales	Whether or not to procure from suppliers; How and to what extent develop local suppliers / distributors; What are appropriate pricing models
FUEL PRODUCT AND SERVICE GROWTH AND INNOVATION	Business development, strategy, product development, marketing	How to develop inclusive business models; How to drive social innovation; how to drive social performance of product portfolios; What are appropriate pricing models

Company A – Understanding, demonstrating and managing social capital impacts

1. Understanding and demonstrating social capital impacts – Company A has worked in collaboration with its government client to conduct an SROI analysis on their contract. The results are helping them shift perception amongst their local government clients towards considering social value for money rather than the lowest possible cost.

2. Managing social capital impacts – Company A is now applying the KPIs used to generate an SROI calculation with bid development and contract managers to appraise and demonstrate the social value of potential projects, and to steer social value improvement activities within current projects.

Relevant social impacts: employment levels, skills development, social services, crime levels

Measurement and valuation approaches: Measurement – KPIs used by managers and as a basis for SROI calculation; Valuation – Monetization through SROI analysis

C. Understand and demonstrate social capital dependencies:

Demonstrating social capital dependencies to business leaders and investors can help them to understand the motivation and justification for investing in sustainability activities. Appropriate measurement and valuation can help business leaders to assess risk and opportunities and decide how much resources to allocate to managing them.

This is an area that is still relatively unexplored by companies, but some examples are emerging.

Measurement: Qualitative and quantitative KPIs representing operational and financial performance related to social capital

Valuation: Companies are using rating systems connected to risk management, but are increasingly investigating the use of monetization approaches to facilitate comparisons across natural, social and financial capital.

TABLE 5:

VALUE DRIVER	KEY DECISION MAKERS	ILLUSTRATIVE DECISIONS
OBTAIN OR MAINTAIN LICENCE TO OPERATE	Business leadership, including the board and executive level	Budget allocation for social programs; Appropriate strategic responses to in country risks and opportunities
IMPROVE THE BUSINESS ENABLING ENVIRONMENT		Budget allocation for employee and talent pool development; Appropriate strategic responses to challenges in local content requirements or meeting skills gaps
OPTIMIZE RESOURCE MANAGEMENT		
STRENGTHEN VALUE CHAINS		Budget allocation for inclusive business and social innovation initiatives; Appropriate strategic responses to challenges and opportunities in supply chains, new market entry, and market growth
FUEL PRODUCT AND SERVICE GROWTH AND INNOVATION		

D. Manage social capital dependencies

As the connection between social capital and business value is increasingly understood, leading companies are actively working to secure and enhance the resources they depend upon from people and society to consistently improve business value.

Measurement: Qualitative and quantitative KPIs representing operational and financial performance related to social capital

Valuation: Not generally applied, but many operational indicators are already monetary figures facilitating easy integration. In some cases companies are using scorecards compiling social and financial performance.

TABLE 6:

VALUE DRIVER	KEY DECISION MAKERS	ILLUSTRATIVE DECISIONS
OBTAIN OR MAINTAIN LICENCE TO OPERATE	Country and regional managers, External relations and corporate responsibility teams, Human resource managers	Selecting plant or operational locations; How to enter or grow in new markets; Which social programs to continue or scale; How to manage local sourcing and resourcing; How to reduce the time and cost of social or regulatory disruptions
IMPROVE THE BUSINESS ENABLING ENVIRONMENT		
OPTIMIZE RESOURCE MANAGEMENT	Human re-source managers	Selecting which employee pro-grams to continue and how to im-prove or scale their performance; How to manage lo-cal sourcing and resourcing; How to improve loyalty and skills
STRENGTHEN VALUE CHAINS	Procurement, marketing and sales managers	Supplier and dis-tributor selection and acceptance; Selecting and im-proving supplier and distributor programs; How to increase quality and capabilities of local suppliers and distributors; How to reduce transaction times and costs
FUEL PRODUCT AND SERVICE GROWTH AND INNOVATION	Business and product development teams	Whether to buy or recommend products and services from the company

Company B – Understanding, demonstrating and managing social capital dependencies

3. Understanding and demonstrating social capital dependencies – Company B is using monetized social and environmental performance within its company balanced scorecard. The scorecard considered both the financial value to the company, and the value for people and the environment in five core areas. It is used by the company’s C-suite and board members to understand both the impact of their inclusive business initiatives and to measure social capital dependencies.

4. Managing social capital dependencies – Company B is also using non-monetized country-level scorecards where national managers are encouraged to balance social, environmental and financial performance. The results guide commercial decisions where managers have to demonstrate both social impacts and increased value for the business.

Relevant social impacts and dependencies: employee engagement, occupational safety, distributor incomes, sales volumes

Measurement and valuation approaches: Measurement – KPIs used at national level to balance social, environmental and financial performance; Valuation – monetization of results presented in corporate balanced scorecard alongside financial performance

III. Current practice: social capital information in decision-making

The previous sections explain that companies are applying specific approaches to measurement and valuation based on their value drivers and the perspective of the decision-makers they are targeting.

In this section, we share some insights into how this pattern is playing out in current practice. Based on the interviews we have carried out with WBCSD member companies, we have seen clusters of examples of companies using social capital information for specific purposes. These are explained in the text that follows.

These examples are not exhaustive, and all companies interviewed highlighted that they are near the beginning of a longer journey - but they do provide some interesting observations into the possible applications of measurement and valuation approaches and how they are evolving.

A. Deepening stakeholder understanding and managing relevant social impacts

Understanding and demonstrating social capital impacts for external stakeholders remains the starting point for many measurement and valuation initiatives, however we are seeing companies moving on from their initial analysis to apply their findings in internal decision-making. Studies which highlight how government and community priorities intersect with the activities of a company can be used to guide impact improvement activities, inform discussions and enhance the company's relationships and reputation. This is particularly effective in situations where the government ambitions are clear or when the company has been provided with a clear framework.

Business value drivers: Obtain or maintain license to operate; improve the business enabling environment

Information users and decisions: Understand and demonstrate – government, media, customers, general public, employees; Manage – national level leadership, project managers

B. Improving local content performance

Where companies have large operations, license to operate can be highly dependent upon local content requirements – the obligation to include local workers, suppliers and distributors in the company's value chain. Companies are using measurement and valuation approaches to ensure the implementation of a local content strategy strengthens both the local economy and the company's performance.

Business value drivers: Obtain or maintain license to operate; improve the business enabling environment; optimize human resource management; strengthen value chains

Information users and decisions: Understand and demonstrate – government and local communities; Manage – local community investment managers, human resource and

procurement managers; social performance and community engagement staff. Where investments are significant, Global Business Unit Presidents and top management can be involved.

C. Supporting entry into new markets

Governments are often the initial gatekeepers for new market entry. While social capital impact studies can help companies to hold informed discussions on the social license to operate and structuring a suitable policy environment in new markets, they can also inform the development and growth of new products and services by helping to understand the market and inform new local stakeholders.

Business value drivers: Obtain or maintain license to operate; improve the business enabling environment (secondary); Fuel product and service growth and innovation

Information users and decisions: Understand and demonstrate – government, institutional customers, individual customers

D. Facilitating government sales and contract development

Governments can be important decision-makers when it comes to product sales and innovative service solutions. This is even more pronounced when the government is the customer. In the UK in particular, the Social Value

Act is driving companies to apply monetization techniques to understand and improve their performance in government contracts.

Business value drivers: Obtain and maintain license to operate, Improve the business enabling environment (secondary), Fuel product and service growth and innovation

Information users and decisions: Understand and demonstrate – government clients, general public, employees; Manage – bid and contract managers, social innovation initiative managers, resource allocation managers

E. Shifting thinking on human capital

Human capital is essential to all companies, but it is generally measured as a cost rather than as an asset, impact or dependency. Human capital intensive companies are beginning to look at how shifting their perspective might lead to better decisions for the company and its employees.

Business value drivers; Optimize human resource management; Obtain license to operate; Strengthen value chains;

Information users and decisions: Understand and demonstrate impact – global leaders, external stakeholders, employees, and clients. Manage impact – client managers, functional leaders, training and human resource managers

F. Driving integrated thinking through Inclusive Business

In inclusive business initiatives (commercially viable, scalable business models that expand access to goods, services and livelihood opportunities for the economically disadvantaged) we see measurement and valuation initiatives seeking to inform all 4 decision- makers perspectives including understanding, demonstrating and managing social capital impacts and dependencies. This brings to life how, ultimately, the WBCSD would like to see companies considering social and business information side-by-side.

Business value drivers: Fuel product and service growth and innovation; Strengthen value chains; Optimize human resource management; Strengthen operating environment.

Information users and decisions: Understand and demonstrate – C-suite, board, executive committee, external stakeholders, investors, executive committee; Manage – managing directors, national managers, sales managers, procurement managers.

IV. Realizing the potential: getting started and advancing your journey

Throughout this paper, we have discussed five business drivers for measuring and managing different types of social capital impacts and dependencies (Section 1), explained why the decision-maker’s perspective is key to selecting relevant measurements (Section 2), and provided insight on how interviewed companies are currently using social capital measurement in decision- making (Section 3).

This section combines learnings gained through the interviews and analysis to draw-up advice for a pragmatic, fit-for-purpose approach in your journey of measuring and managing social capital.

A. Questions to ensure measurement and valuation can inform decision-making

Based on our interviews, the following are key questions a company should ask when starting or continuing its efforts to measure and value social capital. These questions can be asked and re-asked at any point in your journey to ensure that measurement and valuation can inform decision-making.

Q. Value drivers (See Section 1)

- Which of the 5 value drivers are motivating the measurement and management of social capital impacts and dependencies? (Multiple answers possible)
- What impacts and dependencies are related to these value drivers?

Q. Decision-maker perspective (See Section 2)

- Who are the internal or external decision-makers you want to inform?
- What decisions do you expect them to take with the information?

- Are they looking to understand, demonstrate and/or manage social capital?
- Are they interested in the impact your company has on social capital and/or in the dependency your company has on social capital?

Q. Fit-for-purpose measurement and valuation (See Sections 2 and 3)

- Based on your answers above, what could be the most appropriate type of measurement and valuation?

B. Considerations for a pragmatic approach to measure and value social capital

We have spoken with companies and other experts on a pragmatic approach for measuring and managing social capital, and have captured their lessons learned in the 3 points of advice below.

A step-by-step process

- Focus your efforts and work step-by-step towards concrete results: start with pilots that have a feasible scope.
- Select pilots that are closely connected to the core business of your organization to show the value of a measurement exercise and use these good examples to demonstrate the business case for measurement internally.
- Just get started – it will be an iterative learning process that cannot be planned exactly.

Building internal buy-in, collaboration and ownership

- Use a committee of board members as ambassadors and to test results. Board-level ambassadors support you in creating awareness and commitment.
- Create a small core team with team members that represent several departments of your organization (finance, business development, procurement, HR, etc.) to encourage ownership and leverage different perspectives. Consider involving the CFO/finance function before involving communications to avoid the risk that a project will be labelled internally as ‘marketing’ or ‘for external reporting purposes’.
- Consider allocating a dedicated change management person within the company at an early stage.
- Secure local input, particularly for multinational companies, as you cannot fully understand social capital issues from a headquarters position.

Leverage external experience and dialogue

- Involving external experts and other practitioners can help to build a credible approach, and can save a company a lot of time ‘re-inventing the wheel’.

- At the same time, carefully consider in which phase of the project it is most suitable to involve which external stakeholders, and select your messaging around how your company aims to use the outcomes of the measurement and valuation project.

V. The road ahead: contributing to the social capital protocol

Today, companies lack a consolidated perspective or toolset for measuring and managing social capital however, with a group of member companies and partner organizations, the WBCSD has issued a call for collaboration to develop a Social Capital Protocol that would bring greater rigor and consistency to companies' efforts in this space. As the Social Capital Protocol is developed and adopted, companies will increasingly be able to use social capital measurement to improve business decision-making and enhance performance.

In the publication 'Towards a Social Capital Protocol – A Call for Collaboration', WBCSD proposes a five step approach for measuring and managing social capital (see Figure 5). With this publication, we aimed to lay the

foundations for further building this process. We have worked with leading companies and partners to provide a concrete overview of the current use and application of social capital measurement and valuation and, in doing so, have gained insights into each of the five steps. This publication illustrates types of social impacts and dependencies which are important for companies and their stakeholders (Step 1), their objectives for measurement in terms of the business value drivers they aim to impact (Step 2), examples of measurement and valuation approaches currently in use (Steps 3 & 4) and, most importantly, an overview of how measurement and valuation results are being integrated into decision-making (Step 5).

Of course, this is just the beginning, and there remains much work to be done. Both WBCSD and KPMG are looking forward to continuing this journey, together with WBCSD members and partners, to further strengthen the concept of social capital, build its usefulness for driving integrated thinking and performance management within business, and move towards a harmonized approach for companies and their stakeholders

TABLE 7: A PROPOSAL FOR A CONSISTENT PROCESS FOR BUSINESS TO MEASURE AND VALUE THEIR IMPACTS AND DEPENDENCIES ON SOCIAL CAPITAL

1/ IDENTITY IM-PACTS AND DE-PENDENCIES	Prioritizing the right issues will drive commitment and support value creation
2/ SET OB-JETIVES, SCOPE AND BOUNDA-RIES	Clarity of aims and limits will focus organizational resources
3/ IDENTITY INDICATORS AND MEASURE IMPACT	Reliable access to tailored information will support targeted action
4/ ANALYZE VALUE	Analyzing the value of so-cial capital will enable its use alongside other business
5/ VALIDATE AND INTEGRATE RESULTS	Integrating the process and results into decision making will result in more integrated thinking and ensure social capital is actively managed

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Learning by Doing - A Sustainable Development Outcome Measurement Methodology for a South African Company

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Abstract: This paper will report on the development, piloting and current implementation of a sustainable development outcome measurement methodology for a large South Africa company, which has extensive investments and operations in the logistics and transport sector.

The paper will reflect on the growing trend to measure the contribution of companies to society and the environment through looking at the methodology development and implementation process. It will reflect on the context for the development of the approach, describe the methodology, its piloting and the lessons learned through this process. It has been drafted concurrently with the piloting, revision and roll out of the methodology and as such should be seen as a work in progress, with the purpose of the paper being to share the initiative, identify lessons learned from it and to treat the observations from the discussion on the paper as guidance for its ongoing adaptation and implementation..

I. Introduction

Due to the current nature of the activity, we have respected the confidentiality of the company referred to in this paper which, notwithstanding, has provided its insights into the drafting of the paper.

Companies are not passive players in the development of society. Businesses create blended value comprised of economic, social and environmental value which they need to be able to account for. In this context, the company, which is reported on in this paper, had as a strategic intent to optimise the social impact of its interventions in pursuit of its objectives.

Recently the company adopted an overarching Sustainability Framework which outlined the long term development goals for the company in the spheres of the economy, society and the environment. A Sustainability Forum was established as part of the company's sustainability governance, to ensure that the ongoing development, monitoring and analysis of sustainability initiatives are driven across the company and fed back to the Group Executive and Board. Furthermore, the company and its main shareholder, the South African Government, engaged in an exercise of

transitioning from an Output-based to an Outcome-based Shareholder Agreement. The revised agreement required that the company should demonstrate both value for money as well as its contribution to socio-economic development and environmental stewardship.

A Sustainable Development Outcome Measurement

Methodology has been developed and piloted to assist the company to analyse, measure, track and report on its contribution to society in an on-going way. The high level conceptual approach to measuring the company's sustainable development outcomes has been developed along five steps which will be discussed in this paper. The following sections will report on the development, piloting and current implementation of the methodology.

The paper will conclude by reflecting on the relevance of the sustainable development outcomes measurement methodology, identify the strengths and weaknesses of its application and demonstrate the significance of this work in setting a standard for substantial measurement of impact in the corporate sphere.

II. Background

Since the 1990s, many methods have been developed to measure social impact. There are a significant number of recognized methodologies or frameworks available which have been developed mainly by, or for, non-profit or governmental corporations to measure quantitative impacts. Research has shown that there is no single tool or method that can capture the full range of impacts or that can be applied by all organisations¹. The challenge for organisations is in knowing what method is suitable for their specific objectives. Furthermore, the adoption by business corporations of such methods is at an early stage.

This paper focuses on work conducted for a large South African transport company to measure its societal impact. The Company appointed Environmental Resources Management (ERM) to develop, pilot and embed a systematic impact measurement methodology over a two year period. This was intended to enable it to manage and measure its social impact, meet its stakeholder expectations and account to its shareholders for the social value it creates. The two year project entailed the development of the

¹ See Zappalà & Lyons, 2006; Tuan, 2008; Rinaldo, 2010

methodology, a piloting phase to test the appropriateness of the defined methodology and thirdly an embedding phase to roll out the methodology across a number of corporate functions within the organisation.

The Company's impact assessment requirements are best understood through reference to the definition by Emerson et al. which focuses on the creation (or erosion) of social value. Specifically, this definition illustrates that a company through its business activities deploys resources, e.g., financial, human, etc., in various processes and according to a range of policies/ guidelines which can change the lives of individuals or society as a whole either in positive or negative ways. Understanding the value created is the basic goal of the work.

III. Approach

It was decided that the methodology (in early development) should adopt the South African Government's Department of Performance Monitoring and Evaluation's (DPME) performance monitoring and evaluation system as its theoretical framework. This system is intended to measure fourteen specific outcomes that collectively address the main strategic priorities of the South African Government and has been designed to ensure that Government is focused on achieving real improvements in the life of all South Africans.

Adopting an outcomes- based approach would clarify what the company expects to achieve, how the company expects to achieve it and how the company will know whether it is achieving it². In order to implement the outcomes-based approach, it was necessary for the company to understand and clarify the logical links between what it does and what it achieves.

In implementing this approach, after considering the requirements and expectations placed on the company by its Government shareholder, and more broadly its stakeholders, a defined set of outcome themes were identified to underpin the approach, namely: employment creation, skills development, industrial capability building, the leveraging of investment, regional economic integration, race and gender transformation, improved health and safety, community development and environmental stewardship. Since these outcomes themes went beyond the originally anticipated focus on the social sphere, the methodology shifted towards the measurement of sustainable development outcomes or in short SDOs.

By adopted the outcomes approach, the role of the theory of change emerged as a crucial ingredient in the measurement methodology. The theory of change approach presents a mechanism to clearly understand the assumptions behind the choices made about what levers of change or programmes are deployed and what the company focuses its

efforts on. It enables the company to clarify what it does to effect change (based on the best available knowledge about causes and effects).

IV. Methodology

A five-step methodology, built around the theory of change approach, was developed to measure the company's sustainable development outcomes and impacts. The methodology sought to provide a structured process that could demonstrate the company's performance in relation to the outcome themes.

Following the initial development of the methodology, it was tested in a piloting phase of work. The company's Supply Chain Management function was chosen for this purpose. This function supports broad development objectives through driving the empowerment and transformation of its supplier base, leveraging procurement for supplier development to support localisation and industrialisation, as well as creating jobs and reducing unemployment. Various projects and initiatives were selected from the function's portfolio in order to pilot test the methodology.

The research and analysis was undertaken during a period of 8.5 months, from mid-July 2014 to March 2015. The research period was defined as Financial Year 2013/2014, i.e., from March 2013 to April 2014 (FY14).

The steps in the methodology were:

Step 1: Scoping

The first step in the methodology seeks to define the scope of analysis. This is an essential part of the methodology as it frames the research and forms the basis from which subsequent steps are carried out.

The company's Supply Chain Management function comprises of two programmes, namely Enterprise Development and Supplier Development. Three Enterprise Development funds and six suppliers that participated in the Supplier Development programme were selected for the analysis.

A Scoping Document was developed that identified and discussed the level of analysis, boundaries of analysis, definitions adopted and timeframes of analysis. The programmes and initiatives identified for the analysis as well as the inputs, outputs and expected outcomes which they aim to generate were also identified and qualitatively described in the Scoping Document.

Step 2: Mapping

The second step sought to identify the indicators to be analysed. A series of meetings were held with relevant teams to generate a set of measurable indicators that would enable

the Company to understand performance within each of the two programmes employed by the supply chain function. In order to do this, the set of indicators to measure the inputs, outputs and expected outcomes for each of the programme interventions, as described qualitatively within the Scoping Document, were defined and compiled within a SDO Map.

Step 3: Plan

The planning step followed, which sought to define a plan for tracking progress against the mapped indicators. This set out how data would be collected in order to assess the indicators selected in Step 2. This work plan included measures to clarify the systems, tools and/ or data collection techniques that would be adopted, the responsibilities for collection as well as the frequency of measurement. A key aspect of this step was to identify existing company internal systems, tools and processes could be leveraged as part of the measurement exercise.

In addition to the data collection plan, detailed stakeholder questionnaires were developed to collect information on the identified indicators. The questionnaires were based on the definitions identified for the indicators and provide clarity on the specific information type to be collected.

Step 4: Collect

The fourth step saw the collecting and verification of data. Data collection proved to be the most time- consuming step in the outcomes measurement process. Main challenges were the unavailability of interviewees as well as lengthy internal approval processes within the company. The collection team met with Fund Managers and the beneficiaries of the Funds as well as with suppliers identified for this analysis. Interviewees were introduced to the questionnaires and requested to complete these within an agreed timeframe.

During this Step the data gathered through the questionnaires was consolidated to enable interpretation of results in Step 5. The main deliverable of Step 4 was a completed SDO Map which presented the data captured for each of the identified indicators.

Step 5: Report

The final step saw the generation of a report to analyse and interpret the data and communicate the results of the analysis. The aim is to reflect what change the Supply Chain Management function has brought about in relation to its sustainable development mandate, specifically in relation to the nine defined SDO themes.

V. Methodological findings

The pilot exercise was valuable in identifying aspects of the methodology that need to be changed or adapted. Key methodological considerations identified through the pilot exercise were:

- The importance of a scoping phase that requires careful consideration of programmes, projects and initiatives that contribute to sustainable development outcomes and change within functions at the corporate level.
- The significance of emphasising an understanding by those involved of the theory of change and the concept of measuring outcomes as opposed to the more conventional input - output measurement model.
- The need for focused discussion and creative thinking amongst all role players in identifying outcome indicators.
- The need to recognise the complex overlaps and inter-dependencies across the sustainable development outcome themes, to take account of the fact that targeted programmes, projects or initiatives can impact more than one theme; or that one outcome indicator can inform more than one outcome theme.
- Acknowledging that data collection is likely to be the most time-consuming step in the outcome measurement process, including the key aspects of objectivity, data verification and quality control to ensure data integrity

The methodology is currently in the process of revision and full roll out across the business.

VI. Indicators

For purposes of the pilot study six suppliers were selected for the Supplier Development initiative and three Enterprise Development funds to test the effectiveness of the methodology. The results of the pilot produced some interesting and positive results, despite the challenges in implementing a newly developed methodology. Some of the key outcome indicators that were measured include:

- Direct and indirect job creation and preservation;
- Increase in gross and net profits of beneficiaries;
- Increased business linkages between beneficiaries and other potential customers;
- Increased technical capacity of beneficiaries;
- Visible improvement of internal systems of beneficiaries;
- Number of Black Small, Medium and Micro-sized Enterprises (SMMEs) (categories by legislative definitions) introduced into the company's Supply Chain;

- Number of Black SMMEs (categories by legislative definitions) sustained;
- Improved functional and technical capability and capacity of contractor/supplier's staff;
- Improvements in business processes/ systems; and
- Increase local industrial capability so as to move South Africa towards an export based economy.

VII. Conclusion

The methodology has evolved through a strategic shift from a purely social outcome measurement process to a process that measures sustainable development outcomes.

The methodology has been successful in aligning the results of the assessment with the South African Government's 14 development outcomes. However the application of the methodology is a work in progress in telling the story of change that the company generates and its contribution to society.

The methodology has been successful in assessing both quantitative and qualitative data and has been flexible to support an evolving mandate. It is anticipated that this methodology will evolve as input from the company's various business functions are integrated, especially to ensure that the methodology is fit for purpose and can work within the company's business context.

The methodology effectively enabled a transition from a traditional input and output view of indicators, to a broader set of indicators which consider outcomes and reflect the actual changes to beneficiaries and society resulting from a specific activity and which would not have resulted without the activity.

By developing and implementing the methodology, the company has undergone some key learnings about an outcomes-based approach to measuring its impacts. It is now slowly coming to terms with the approach especially in terms of the challenges of implementing such a methodology in a private sector-focused organisation.

This work has been significant in setting a standard for substantial measurement of impacts in the corporate sphere. Because of its novelty in this context, there are birth pains in its application. Hence it is a process of learning by doing.

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Aligning with the Sustainable Development Goals

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Abstract: Businesses will be called upon to support the Sustainable Development Goals and mobilize action. The purpose of this article is to discuss the implications of aligning corporate sustainability measurement practices with the new global development agenda set in September 2015. cutting edge technology with a global reach [7]. Businesses with a forward thinking sustainability visions will begin to link their sustainability performance measurement processes to the SDGs in order to demonstrate their commitment.

I. Introduction

National governments, citizens of the world and the United Nations are deciding on the post-2015 global development agenda to succeed the Millennium Development Goals (MDGs). The Sustainable Development Goals (SDGs) will set the global development agenda for next 15 years. With adoption of the SDGs by the UN General Assembly in September 2015 at the UN Summit, businesses will be called upon to take action and lead the world towards a sustainable future. In this article I posit that in order for business to engage with the SDGs and demonstrate their commitment to global development frameworks, a new approach to measuring social and environmental impacts at the organizational level is critical.

II. Learning from the mdgs

The MDGs brought together stakeholders from around the world to form partnerships for sustainable development. One well recognized shortcoming of the MDGs process is the lack of a measurement framework to demonstrate progress towards achieving the goals. Learning from previous experience with the MDGs, more emphasis will be placed on quantifying impacts with the SDGs. The Sustainable Development Solutions Network (SDSN) call for a data revolution to monitor progress taken towards achieving the SDGs, "The experience of the Millennium Development Goals (MDGs) underscores the importance of thinking through the indicators as early as possible; we cannot afford a lag of several years before we start to measure progress towards achieving the SDGs," [1]. The implications of a data revolution and the increasing importance on quantifying measureable success towards achieving the SDGs are still unknown.

Learning from the MDGs, the expectations of private sector contributions to the post-2015 agenda will be heightened. Businesses are already being called upon to support the SDGs and mobilize action [2], [3]. In the process of developing

the SDGs, three main reports, the Open Working Group Proposal for Sustainable Development Goals, the synthesis report of the UN secretary-general The Road to Dignity by 2030, and the Rio+20's The Future We Want, have indicated that governments will need the support of other change agents such as business if the SDGs are to be successful [4]. [6]. The leadership of the private sector is critical to employ

III. Alignment with the sdgs

To demonstrate commit to global sustainable development businesses will need a new approach to measuring sustainability. A link between organizational social and environmental impacts to the targets set by the SDGs is needed. Linking business impacts to the SDGs will require new organizational processes that require internal sustainability goal setting to be linked with the global development framework set by the SDGs.

Three international organizations, the Global Reporting Initiative (GRI), the UN Global Compact (UNGC) and the World Business Council for Sustainable Development (WBCSD) are working together to publish a guide for business action on the SDGs, called the SDG Compass. The intent of the guide is to provide companies with guidance on how to align their sustainability goals with the targets of the SDGs and to monitor their progress. The guide suggests that business will have to first understand the SDGs and leverage the business case internally for engaging with the SDGs. Second, businesses will need to assess impacts on the SDGs and identify priority areas where the most impact can be made. Third, business should set goals that are aligned with the SDGs. Forth, business should engage in implementation of a sustainable development strategy by integrating sustainability in the core of the business while engaging in collective action to achieve the SDGs. Fifth, businesses will need to meaningfully report on alignment with the SDGs.

IV. Contributions & conclusions

This case study aims to make several managerial and theoretical contributions. For sustainability managers, this research is important because sustainability is no longer an option to maintain a license to operate [8]. The expectation for business to engage with the SDGs is growing and to maintain legitimacy businesses will begin to report on the SDGs. Managers can learn from this case study on how leading companies are engaging with the SDGs to better implement their own internal process for SDG alignment.

I also aim to make two contributions to the literature on corporate sustainability. A recent review on measuring sustainability performance finds that scales and instruments created by external organizations (i.e. Dow Jones Sustainability Index or the Global Reporting Initiative) are used to measure firm level sustainability performance and compare sustainability performance across firms^[9]. While this literature is valuable it does not address how firm performance links to international development agendas such as the SDGs.

This case study recognizes the embeddedness of business in society and nature. Much of the corporate sustainability literature fails to take an embedded view of business, society and nature and rather views the systems as loosely connected^[10],^[11]. Alignment with the SDGs provides a case where business must shift from an internal perspective of sustainability to an external performance of sustainability. This shift will require a realization that business is dependent on well-functioning social and environmental systems. This case study will also contribute to the literature on corporate sustainability by recognizing the interconnections between organizational, social and environmental systems. Research tends to examine systems in isolation without considering how systems are interconnected^[12]. The SDGs are a holistic framework and when businesses align with the SDGs and assess their impact, decisions will have to be made that consider the interconnections of social and environmental systems.

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'Eco-Ratio Analysis' in Business Sustainability Performance Measurement

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Abstract: Eco-aware customers and stakeholders are demanding for a measurement that links environmental performance with other business operations. To bridge this seemingly measurement gap, this paper suggests 'Eco-Ratio Analysis' and proposes an approach for conducting eco-ratio analysis. It is argued that since accounting ratios function as a tool for evaluating corporate financial viability by management and investors, eco-ratio analysis should be brought to the fore to provide a succinct measurement about the linkage between environmental performance and conventional business performance. It is hoped that this suggestion will usher in a nuance debate and approach in the teaching, research and practice of environmental management and sustainability accounting.

Key words: eco-ratio analysis, business sustainability, performance measurement, accounting ratios..

I. Introduction

Extant research indicates that eco-aware customers and stakeholders require additional measurement that links environmental performance with other business operations^{[14], [16]}. This implies that as the campaign for business sustainability heightens, more measurement tools are needed for the development of sustainability management accounting^{[1], [2]}. Whilst 2015 is critical for businesses to rethink the future of business in consideration of climate change and sustainable development, it is also apposite to reflect on new ways of evaluating business sustainability performance to satisfy the environmental yearnings of customers and stakeholders^[16].

Many gaps and/or challenges in measuring sustainability performance subsist in current environmental management accounting measurement^[3]. Sustainability accounting is regarded as a complement to financial accounting; a blend of these separate reports should proffer a clearer view of environmental, social and economic performance of business. However, the sustainability part of the current accounting measurement is still developing. This paper is concerned with one gap – the financial section of

accounting reports has accounting ratios embedded into it, but environmental performance ratios or eco-ratio analysis, has not been integrated into sustainability management accounting measurement. Therefore, the question that underpins this paper is how eco-ratio analysis may be brought into current sustainability management accounting. Accordingly, the sole objective of this paper is to propose the introduction of eco-ratio analysis and to suggest an approach for conducting eco-ratio analysis as an additional sustainability performance measurement-tool. Accordingly, the next section of this paper presents a brief related literature; following this, a suggested approach to eco-ratio analysis is presented. The final section is the conclusion.

II. Related literature

Irrespective of rebuttals and endorsements about the objective of business, Garriga and Melé,^[4] suggests that social issues and profit objective must be integrated to enhance corporate success (see also Chan et al.)^[5]. It is no longer a hear-say that there is a business sense in corporate social and environmental initiatives as it has been proven to be worth doing^[6]; therefore, what is worth doing is worth measuring, sustainability accounting came into being to offer measurement support to sustainability management^[7]. Consequently, eminent scholars have contributed significantly to improve accounting measurement for corporate social and environmental initiatives. These include inter alia, Kaplan and Bruns^[8], Kaplan and Atkinson^[9] with an introduction of activity based costing (ABC) which has been used extensively in environmental management accounting; Burritt & Schaltegger^[10], Schaltegger & Burritt^[12] developed ecological efficiency framework in corporate budgeting, and a measurement for supply chain sustainability performance. Furthermore Lee & Wu^[11] introduced a multidimensional measurement of environmental and economic performance; and Cintra,^[13] developed a simulation of environmental balance sheet. However, there are still a myriad of measurement gaps such as relating ecological cost management to firm's cost and operational efficiency, Henri et al.^[14]; Henri and colleagues posits that

environmental cost performance needs to be linked to firm's cost structure and operational efficiency^[14]. This is important as managers are in need of "non-traditional data" and measurement system to guide sustainability strategic decisions [15, p.5]. Henri et al.^[14]. This may be addressed through an eco-ratio analysis – comparing environmental cost performance with firm's cost and operational efficiency; but the concept of eco-ratio analysis is currently absent in environmental management accounting literature and practice. To the best of authors' knowledge, eco-ratio analysis is still silent in academic, research and practice of environmental accounting. Therefore, this paper presents a suggestion for integrating 'eco-ratio analysis' into current environmental or sustainability accounting. This is a modest response to the suggestion by researchers such as Kolinski and Sliwczynski^[16] and Horisch et al.^[17] that contemporary customers and stakeholders, not only need information on environmental performance, they also need information on the linkage between environmental performance and other business processes. Hence, the authors suggest that the desired linkage may in addition to other measures, be through an 'eco-ratio analysis' that shows, at a glance, a specific environmental performance ratio relative to firm operations and investment. A hypothetical suggested approach to 'eco-ratio analysis' is presented in the following section, for subsequent refinement by academics, researchers and practitioners.

III. Suggested approach to eco- ratio analysis

Given the absence of 'Eco-Ratio Analysis' in current sustainability accounting literature and in practice, and considering the growing demand for more sustainability performance measurement, the authors present the following suggested 'Eco-Ratio Analysis' approach using a hypothetical company – Responsible Biz Ltd.

A. ECO-INVESTMENT RATIOS IN RESPONSIBLE BIZ LTD. (A HYPOTHETICAL COMPANY).

In this suggestion, yearly expenditure or costs incurred to enhance corporate sustainability initiatives are termed eco-investment and are related to firm's total investment, capital structure and revenue.

**TABLE 1 RESPONSIBLE BIZ LTD. YEARLY PERFORMANCE
FIGURES WITH SUGGESTED ECO-RATIOS**

Year	2014	2013	2012	2011	2010	2009
Performance	\$	\$	\$	\$	\$	\$
Total Assets	10000000	8000000	6000000	5000000	4000000	3000000
Owner's Equity	6000000	5000000	4000000	3000000	2000000	2000000
Revenue	2000000	1800000	1600000	1400000	1200000	1000000
Eco-Expenses						
Energy Savings.Exp.	400 000	300 000	195 000	155 000	120 000	80 000
Waste Mgt Exp	400 000	300 000	188 000	150 000	90 000	64 000
Social. Exp.	105 000	120 000	130 000	134 000	120 000	110 000
Water Savings Exp.	380 000	280 000	190 000	150 000	110 000	60 000
Eco-Investment Ratio Analysis						
Eco-Exp. to Asset Ratio*						
Ener Savings.Exp.to Assets	4%	3.7%	3.3%	3.1%	3%	2.7%
Waste Mgt Exp to Assets	4%	3.8%	3.1%	3%	2.3%	2.1%
Soc. Exp. to Assets	1.1%	1.5%	2.2%	2.7%	3%	3.7%
Water Savings Exp.to Assets	3.8	3.5	3.2%	3%	2.8%	2%
Eco-Exp. to Equity Ratio						
EnerSavings.Exp.to Equity	6.7%	6%	4.9%	5.2%	6%	4%
Waste Mgt Exp To Equity	6.7%	6%	4.7%	5%	4.5%	3.2%
Soc. Exp. To Equity	1.8	2.4%	3.3%	4.5%	6%	5.5%
Water Savings Exp. To Equity	6.3%	5.6%	4.7	5%	5.5%	3%
Eco-Exp. to Rev Ratio						
EnerSavings.Exp.to Rev	20%	16.7%	12.2%	11.1%	10%	8%
Waste Mgt Exp to Rev.	20%	16.7%	11.8%	10.7%	7.5%	6.4%
Soc. Exp. to Rev.	5.3%	6.7%	8.13%	9.6%	10%	11%
Water Savings Exp.to Rev.	19%	15.6%	11.9%	10.7%	9.2%	6%

**SOURCE: AUTHORS' PROPOSED ECO-RATIO ANALYSIS
APPROACH WITH HYPOTHETICAL DATA FOR A HYPOTHETICAL
COMPANY (RESPONSIBLE BIZ LTD). *ECO-EXP. TO ASSET RATIO
= ECO-EXPENDITURE / ASSET**

B. ECO-PROFIT RATIOS IN RESPONSIBLE BIZ LTD. (A HYPOTHETICAL COMPANY)

In this suggestion, yearly savings derived from enhanced corporate sustainability initiatives are termed eco-profit and are related to firm's operating profit.

**TABLE 2 RESPONSIBLE BIZ LTD. YEARLY PROFIT PERFORMANCE
FIGURES WITH SUGGESTED ECO-RATIOS**

Year	2014	2013	2012	2011	2010	2009
Performance	\$	\$	\$	\$	\$	\$
Operating Profit	1200000	1120000	1100000	1000000	800 000	600 000
Eco-Savings						
Energy Savings Income	160 000	128 000	120 000	105 000	80 000	58 000
Water Savings Income	120 000	100 000	96 000	86 000	60 000	40 000
Eco-Profit Ratio Analysis						
Eco-Income to Profit Ratio						
Energy Savings Income to Profit	13.3%	11.4%	10.9%	10.5%	10%	9.6%
Water Savings Income to Profit	10.00%	8.9%	8.73%	8.60%	7.50%	6.67%

C. LINE CHARTS: ECO-INVESTMENT PERFORMANCE RATIOS FOR RESPONSIBLE BIZ LTD 2010 - 2014

In this suggestion, yearly savings derived from enhanced corporate sustainability initiatives are termed eco-profit and are related to firm's operating profit.

TABLE 2 RESPONSIBLE BIZ LTD. YEARLY PROFIT PERFORMANCE FIGURES WITH SUGGESTED ECO-RATIOS

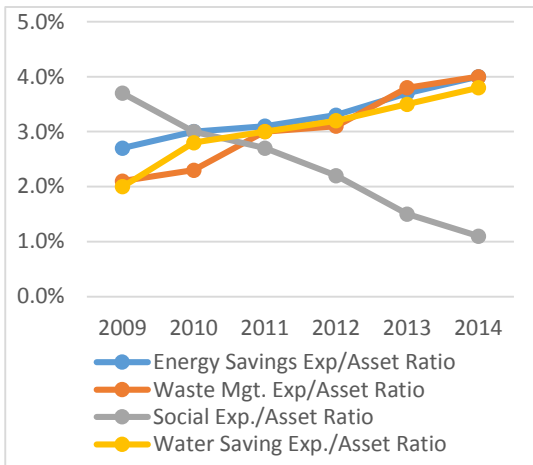


FIGURE 1 LINE CHART: ECO-EXPENDITURE TO ASSET RATIOS 2010 – 2014 RESPONSIBLE BIZ LTD

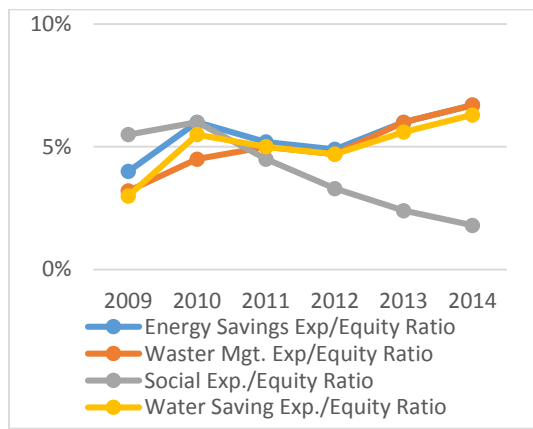


FIGURE 2 LINE CHART: ECO-EXPENDITURE TO EQUITY RATIOS 2010 – 2014 RESPONSIBLE BIZ LTD

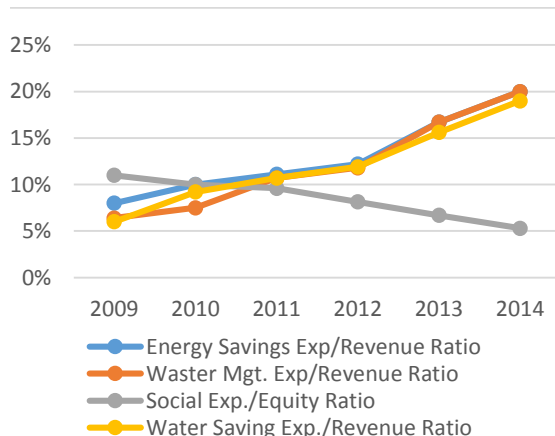


FIGURE 3 LINE CHART: ECO-EXPENDITURE TO REVENUE RATIOS 2010 – 2014 RESPONSIBLE BIZ LTD

The 2014 eco-investment performance ratios for Responsible Biz Ltd may be summed as:

$$[\Sigma En_{1-3} + \Sigma Wa_{1-3} + \Sigma So_{1-3} + \Sigma Wr_{1-3}] / 3 \quad (1)$$

Where:

ΣEn_{1-3} = summation of Energy savings expenditure ratio for asset, equity and revenue

ΣWa_{1-3} = summation of Waste Management expenditure ratio for asset, equity and revenue

ΣSo_{1-3} = summation of Social expenditure ratio for asset, equity and revenue

ΣWr_{1-3} = summation of Water savings expenditure ratio for asset, equity and revenue

3 = three stratums (asset, equity and revenue).

The value derived from the above formula may therefore be regarded as the 2014 eco-ratio performance rating for Responsible Biz Ltd. This rating can thus be used to prepare an eco- performance industry comparison for related companies in the industry.

Therefore by including all the relevant corporate eco-activities not including in the preceding hypothetical illustration, and since the above suggestion are in sections or stratums, a company's eco-investment performance, say for two or more number of years might be represented in a straight line relationship using a panel data regression as follows:

$$\gamma = \alpha + \beta_1\chi_1 + \beta_2\chi_2 + \beta_3\chi_3 + \beta_4\chi_4 + \beta_n\chi_n + \dots + \epsilon$$

Where: γ = annual eco-ratio performance rating; α = constant (γ intercept); β_1-n = regression coefficient; χ_1-n = environmental sustainability activity expenditure or eco-expenditure.

From the above suggested 'eco-ratio analysis' and concomitant production of annual data, academics, researchers and practitioners, may easily prepare a statistical estimation of a company's eco- performance rating. It will also produce a useful data for managers and responsible investors to extrapolate a company's sustainability performance.

IV. CONCLUSION

This paper used a hypothetical firm – Responsible Biz Ltd to propose 'Eco-Ratio Analysis' as an additional measure of business sustainability performance. Since current practice and academic theory in sustainability management and accounting is yet silent about the concept of 'Eco-Ratio Analysis', the paper thus contributes a modest nuance to

existing literature and practice in sustainability accounting. It is the authors' hope that this suggested measurement would attract further refinements, and may also spur academic and research agenda in theory and in practical case studies to apply 'Eco-Ratio Analysis' in single firms and in industry comparison for eco-performance. 'Eco-Ratio' trend analysis is significant, as it would provide a spot assessment of sustainability performance to management, investors, customers, stock exchanges, the government and diverse stakeholders; it might also refocus business sustainability from being industry riveted to address wider ecological and social problems as suggested by Whiteman et al. [18]. It will also contribute additional topic for classroom discussion in sustainability accounting lectures.

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Risk Governance for Sustainability and Innovation Management

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Abstract: Based on methods and experiences developed by the International Risk Governance Council, this paper suggests that the field of risk governance provides insights and instruments that contribute to improving overall effectiveness in risk management, in sustainability management and in innovation management.

Private sector organisations aim to improve their overall competitiveness for both now (the short term) and the future (the long term). They work to manage (avoid, prevent, manage, reduce, transfer) existing risks, as negative outcome of uncertain events, while at the same time aiming to increase their capacity to take risk (their risk appetite), in order to develop their competitive advantage. They also know that their capacity to operate in a sustainable manner will be critical to their long-term success, but that pursuing sustainability objectives may be done at the cost of losing some short-term advantages. The question is thus: how to reconcile these conflicting objectives? How to make them complementary?

As a corporate function, modern risk management has its place at the centre of the organisation. It is a cross-cutting function that spans across technical risks with physical impact, financial risks, reputation risk, etc. However, the function too often aims to reduce risk to a figure, a function of probability and severity. In many cases however, this is not realistic or even possible, for three main reasons: (a) the uncertainty is not well captured in probabilistic risk analysis or cannot be captured because of irreducible uncertainty; (b) the complex adaptive systems in which risks nowadays develop are too complex to be modelled in a way that enables risk manager to correctly account for the many sources of risks and their cascading consequences, and (c) risk management decisions often result also from a judgement, that is made at a board or political level, and thus takes some distance from the strict outcome of risk assessment. Many decisions about risks (including some that will affect other actors, not involved in the decision) are often the result of a political, economic or other ideological evaluation, which is difficult to capture in standard risk analysis processes.

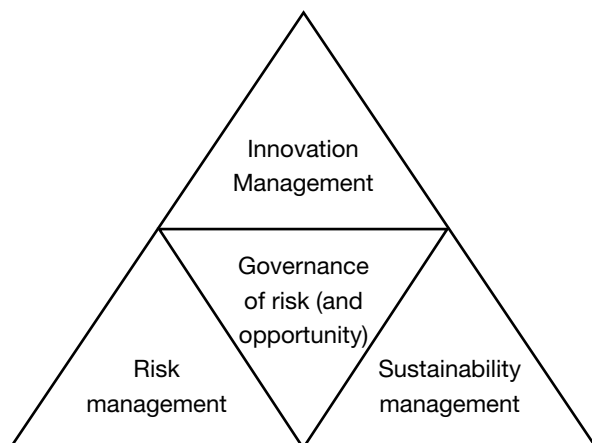
Risk management in complex adaptive systems, such as those in which cyber risks develop, at the intersection between cyber systems and physical systems, requires a complex approach to risk that analyses the threats (and the motives behind the threats), the exposure and vulnerability of the affected organisation or system, and the consequences

(often cascading). Ultimately, it often focuses mainly on the protection of important assets, while leaving other risks unattended.

Risk management is a core function in organisations, which benefits from being expanded to risk governance, to contribute also to improvements in sustainability management and innovation management, as summarized in Figure 1.

FIGURE 1: GOVERNANCE OF RISK AND OPPORTUNITY

I. Risk governance can improve the effectiveness of risk management



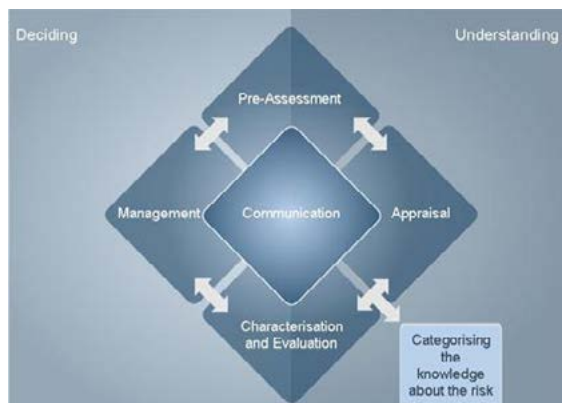
Governing risk in complex interconnected systems requires a comprehensive approach to:

- Frame the issue in order to determine the context in which a risk develops, the actors involved and the type of analysis that needs to be done;
- Perform an interdisciplinary scientific assessment, involving both natural sciences and social sciences;
- Assess people's concerns and perceptions about a risk issue. It is proven that people perceive risks according to certain heuristics and biases. For example, they are less afraid of risks that they know well than of those that they are not familiar with. Also, insights from behavioural sciences can prove to be particularly useful to help understand why people don't behave in the so-called rational way;
- Involve stakeholders in the assessment and in the management of a risk, particularly when multiple views about a risk are revealed and when the collaboration between actors is important;

- Identify the policy, regulatory or economic incentives that are important, either as risk drivers (contributing to amplify the risk) or as factors that can mitigate the risk [2]. Risk management measures can only be effective if the people and organisations that are expected to apply them are motivated to do so;
- Acknowledge that decisions about how a risk is managed depends on a judgement, as well as on its technical assessment: the outcome of a risk assessment can be formulated with regard to its acceptability and tolerability (after risk reduction). Managers often have specific interests or pursue specific objectives;
- Work to overcome the most frequent deficits observed in how systemic risks are managed;
- Investing in risk communication;
- Choose the risk management instruments at the right intervention time. Managers most often have several options (or instruments) for managing risk.

These features of risk governance are described in the IRGC risk governance framework [3] illustrated in figure 2.

FIGURE 2: IRGC RISK GOVERNANCE FRAMEWORK



II. Sustainability can be improved by working to resolve trade-offs

Considering that sustainability itself results from an appropriate assessment of long-term risks, sustainability management requires a balanced analysis of the consequences of short-term risks and opportunities, vs. the pursuit of long-term objectives. This analysis requires careful trade-off resolution:

- Between risks. Various factors affect the actual possibility to manage a risk, including: insufficient scientific knowledge or uncertainty, lack of support or resources. Prioritisation is thus an important task to select those risks and their

management options that can be implemented. This is particularly needed when the timing of intervention and the effect are not aligned;

- Between risks and opportunities. Many risks arise as a result of opportunities that are pursued. So a balancing of expected benefit and expected cost needs to be done.

The science of decision-making is increasingly used in enhanced risk management, for its capacity to help optimise decisions under risk and uncertainty and to build robust decisions, that minimise cost and maximise benefit under various scenarios.

III. Risk governance also informs innovation management

Acknowledging that risk management in general, and management of emerging risks in particular, is a success factor for innovation management, companies aim to select risk management options that enable innovation without constraining it. The process begins by incentivising people to identify, communicate and evaluate those risks that are incurred by the innovation process, without conveying a negative message to those who innovate.

There are similarities between innovation management and emerging risk management, which IRGC describes in its Emerging Risk Governance Guidelines [4], illustrated in figure 3 below. Innovation is an objective, and adopting a forward-looking view on risk enables to identify those emerging risks that may affect the organisation. This is a central feature in risk governance, which links risk, sustainability and innovation.

FIGURE 3: IRGC EMERGING RISK GOVERNANCE GUIDELINES



IV. Applications

Insurance companies such as the Swiss Reinsurance Company aim to pursue opportunities from risk incurred by others, while reducing their own risk exposure. They frequently adopt risk governance approaches such as those described in this paper ^[5]. The structured approach enables them to develop insurance schemes that reward their risk appetite for calculated risk taking. Most organisations such as Shell that develop explorative scenarios to look to their future also adopt risk- and opportunity-based approaches to support their decision- making processes. This is exemplified by frameworks developed by the European Food Safety Authority (EFSA) ^[6], the European Agency for Network and Information Security (ENISA) ^[7] or in the CEN workshop agreement on managing emerging technology- related risks ^[8].

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Supporting industrial decision-making by sustainability performance measurement: Bridging the gaps between sustainability performance research and sustainability performance management in industry

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Abstract: Both, sustainability performance research and sustainability performance management in industry have been developed over decades. But the inherent characteristics of the different settings led to gaps in the concepts. Our paper identifies five gaps: time (short-term vs. long-term), space (legal entity vs. global impacts), data (archival vs. real time), communication (interdivisional vs. interdisciplinary) and design (ex ante vs. ex post). We explain the identified gaps and present research approaches how to close them.

I. Introduction

Since the provocative statement of the Nobel prize winner Milton Friedman in 1970 „The social responsibility of business is to increase its profit“ [1], business researchers have conducted hundreds of studies to measure sustainability performance [2] and relate it to financial performance [3]. But what research is needed to advance management practice? In industry, previous efforts have yielded improvements in sustainability performance, but new topics are constantly raising and the overall ecological and social challenges on our planet are continuously increasing.

TABLE 1: GAPS BETWEEN ACADEMIA AND INDUSTRY

Topic	Academia	Industry	Gap	Research approach
Time	Natural sciences, like climate research focus on long-term horizons, like 2100 and thus address intergenerational aspects.	Decision making in industry is mostly shortterm, not even covering the time horizon of one generation of 30 years.	Time horizons of decision making in industry do not allow sustainability.	Organizational Resilience
Space	The focus of research is on data gathered for the legal entity.	Supply Chain Management is a topic in industry, but hard to operationalize.	The need for vertical integration and thus intragenerational issues is not stressed adequately both in research and in industry.	Sustainable Supply Chain Management
Data	Research is often based on archival and out-dated data	Industry has the challenge to collect the data relevant for decisionmaking.	Sustainability performance data and processing is a challenge for research and industry.	Sustainability Management Control Systems
Communication	Interdisciplinary research is a challenge.	Communication and interpretation of data is difficult between departments.	A common language is missing.	Sustainability Hermeneutics
Design	Research studies are mostly ex post analyses due to data	Industry need data for ex ante analysis.	The time perspective differs.	Scenario Planning

How should industry integrate sustainability performance in decision making? And what are promising directions for future research? And finally: How can academia and industry collaborate better?

The aim of our paper is twofold: First, we identify existing gaps between sustainability performance research and sustainability performance management in industry. Second, we propose approaches for closing the identified gaps.

II. Approach and examples

Examples will be shown that explains, how research activities in those topics can end in the successful implementation in decision-making processes. In the topic “Data” it is needed to get a clear idea on the sustainability of a product or process the whole supply chain from cradle to grave has to be taken into consideration. The data for this evaluation step should be updated and linked with research data and newest developments of academia. What is the most suitable way to provide scientific based evaluation results for decision making and to ensure avoiding green washing? Academia can deliver technologies to solve this question and

support industry with applicable and easy to use and easy to understand solutions. Generic data in cooperation with business partners can be a basis for further development and the support of decision-making processes to achieve more sustainable solutions for the society.

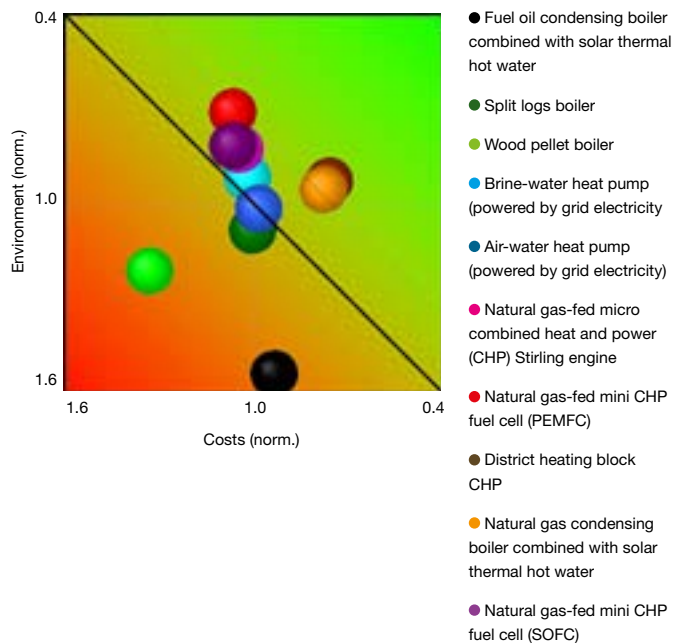
An example for carrying out an Eco-Efficiency study was the decision-making for house heating systems. The goal was to compare alternative systems for providing space heating and hot water for domestic buildings (de-tached houses, new developments), examining both renewable and non-renewable fuels and to identify the most eco-efficient solution. This study was a data challenge as well as a challenge for long time horizons. The Eco-efficiency Analysis (EEA) was based on the ASUE study [4]; the EEA study examined a subset of the systems in the ASUE study and adds some additional heating systems.

Conclusion

The research on Organizational Resilience can be a research topic to integrate the scientific and sustainability findings in long-term decisions of companies. In a typical sustainability evaluation, there are often huge ranges of single data needed which can not be understood in a defined objective way without the help of a methodology that aggregates all the information to a final result by using defined algorithms.

A systematic data collection and definition of data needs should be done in close cooperation of industry and academia due to the higher need for sophisticated information in the future

FIGURE 1: ECO-EFFICENY PORTFOLIO OF HEATING SYSTEMS IN GERMANY



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Measuring sustainability performance along the supply chain

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Abstract: Companies are increasingly held accountable of the sustainability impacts of their subsidiaries and suppliers. The development of sustainable supply chain management increased the need for measuring supply chain impacts beyond the fences of the company. In Hybrid accounting, also called environmentally extended input-output analysis, sectoral monetary input-output tables are used to estimate spillover sustainability impacts. The method is applicable for measuring spillover carbon impacts, ecological footprint, resource use and in conceptually it can be used to estimate cumulative social impacts.

The paper overviews the state of the art of hybrid accounting, pointing out the most critical issues of adopting the method.

I. Introduction

The risks of malfunctioning Sustainable Supply Chain Management (SSCM) is highlighted by scandals such as the Killer campaign of Greenpeace against Kitkat or the Rana Plaza sweatshop fire incident in Bangladesh. As a result, companies are increasingly held accountable of the sustainability impacts of their subsidiaries and suppliers. Thus, SSCM goes far beyond being an environmental issue, increasingly impacting core business strategies of multinational companies.

The development of SSCM increased the need for measuring supply chain impacts beyond the fences of the company. Studies on these impacts agree about the magnitude of the problem. An estimation by Huang et al. (2009c) suggested that supply chain-related spillover carbon emissions could account for as much as 75% of total GHG emissions of a company.

Hybrid accounting, also called environmentally extended input-output analysis, is a tool applicable to capture supply chain impacts of a sector or a company. It combines sectoral monetary input-output with company level monetary and physical data. The method is applicable for measuring spillover carbon impacts, ecological footprint, resource use and in conceptually it can be used to estimate cumulative social impacts.

The paper overviews the state of the art of hybrid accounting, pointing out the most critical issues of adopting the method and will also highlight high potential areas, like measuring cumulative social impacts, e.g. employment.

II. Organizational boundaries and spillover impacts

Defining organizational boundaries is of utmost importance in accounting for SSCM impacts. The example of greenhouse gas emissions will be used to demonstrate how changing organisational boundaries would change how emissions are assigned to Scope 1, Scope 2 or Scope 3. The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes'. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Reporting Scope 1 and Scope 2 emissions is mandatory in the carbon disclosure project and quite common even in companies not participating in the carbon disclosure project. Scope 3 emissions include all indirect emissions, both upstream and downstream. They account for 75 % of all emissions, but are reported only by a limited number of companies.

Emissions cannot always be categorised into scope 2 or scope 3 unambiguously. Two approaches can be defined in corporate emission accounting: the equity share approach and the control approach (WRI and WBCSD, 2004: 16-24; Dragomir, 2012). The equity share approach, accounts for GHG emissions from the operations of the company based on its share of equity. Control of the company can be financial and operational. 'The company has financial control over the operation if the former has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from its activities' (WRI and WBCSD, 2004, Chapter 3, p.17.). 'A company has operational control over an operation if the former or one of its subsidiaries (see Table 1 for definitions of financial accounting categories) has the full authority to introduce and implement its operating policies at the operation' (WRI and WBCSD, 2004, Chapter 3, p.18.).

TABLE 1 shows how emissions can be allocated to different scopes depending on the financial or operational control of the corporation over the asset that causes the emissions. If a leased passenger car is within the financial control of the company and it appears as an owned asset in the balance sheet then emissions are allocated to scope 1 emissions. If there is no exclusive financial control over the asset, the emissions of the leased car should be accounted for as scope 3 emissions. If the indirect emissions of a truck that uses electricity are within the financial or operational control

of the company than it should be accounted for as scope 2 emissions. When the company does not fully control the asset either financially or from an operational point of view, then emissions should be allocated to scope 3 emissions, as indirect emissions over which the company does not have direct control.

Identifying how much control a company has over its operations can be extremely important. Revealing the indirect, scope 2 and scope 3 impacts of a company could completely change the results of its environmental performance.

	Financial control approach		Operational control approach	
Company owned fleet	leased fleet	company operated fleet	operation of fleet is subcontracted	
direct emissions of leased passenger car fleet	Scope 1	Scope 3	Scope 1	Scope 3
indirect emissions of an electric forklift-truck (operated using electricity)	Scope 2	Scope 3	Scope 2	Scope 3

Research has been done with industry GHG accounting to discover scope 3 emissions (Higgs et al., 2009; Hillman and Ramaswami, 2010; Huang et al., 2009b; Steuer, 2010). Huang et al. (2009b) revealed that most emissions in the electronics manufacturing and computer services sectors do not come from scope 1 emissions but from scope 3 emissions embodied in materials and components. Higgs et al. (2009) examined scope 3 emissions in the semiconductor manufacturing supply chain of Intel. The analyses provided an example to the company of how indirect impact could be calculated. The research findings of Larsen and Hertwich (2009) confirmed that accounting for exclusively production-based, direct emissions can be misleading in municipal services; a fact already pointed out by Suh (2006b). In the city of Trondheim 79% of total emissions were scope 3 emissions.

Data about embodied emissions in imported products were replaced by lifecycle data in the ENVIMAT model developed by Seppala et al. (2011). Hybrid accounting of GHG emissions and material flows was used. The ENVIMAT model supplements previous life-cycle analysis using a hybrid-LCA approach (Mattila et al., 2010). Indirect impacts of material, waste, energy and monetary flows in service industries were accounted for by Shrake et al. (2013). Results of hybrid LCA methodology yielded more detailed and more precise results than the simple environmentally-extended input-output analysis. Ozawa-Meida (2011) applied the GHG Protocol to calculate the consumption-based emission inventory of a university. Scope 3 emissions comprised 79% of the total emissions, while procurement emissions contributed to 48% of scope 3 emissions. This research highlighted the need for assessing scope 3 emissions in higher education institutions as well. Few examples can be found where scope 1 impacts have proven to be greater than scope 3 impacts. Analysis of marine shipping service companies and ambulance services

have shown that the greatest part of environmental impact resulted from direct operations (Ewing et al., 2011; Brown et al., 2012).

III. Using the results of hybrid accounting

The results of hybrid input-output and LCA analysis can be used to inform companies on major sustainability impacts, either direct or indirect, thus the company may decide how to deal with them.

Even though some impacts occur beyond the fences of the company, the company may gain more control over them than other actors. For example, the emission of cars during the use phase is mostly determined by engine design, although consumers also have their share of responsibility. Figure 1 shows control options of spillover impacts.

The company may also inform suppliers, consumers and other actors in the supply chain about which activities they should focus their emissions reduction strategies on.

While outsourcing high risk environmental services used to be a common practice previously, some companies now decide to insource (contract back) those activities, converting Scope 3 into Scope 1 activities (e.g. waste treatment). Increasing responsibility for supply chain activities and uncertainties in controlling contractors may justify such decisions.

Hybrid accounting may also be used to present understandable and practical results to policy-makers (Hertwich, 2005). Input-output analysis can be used as a screening tool in order to reveal the most significant scope 3 emission sources and it can account for the full upstream supply, thus boundary cut-offs can be avoided (Murray et al., 2010).

IV. Critical issues in applying hybrid accounting

Over half of the firms reporting through the Carbon Disclosure Project use the Greenhouse Gas Protocol. The CDP provides a framework for improving the measurement of scope 3 GHG emissions. It can be regarded as a successful case of entrepreneurial authority (Green, 2010). Still, reporting scope 3 emissions is rare and most often focuses on simple issues, such as employee mobility. Methodological guidelines should be provided for companies to account for indirect emissions, otherwise their reports will not be comparable.

Hybrid accounting assumes homogenous technologies within a sector, an assumption that may not hold. High detail monetary input output tables (300 x300 or even more) will lead to more accurate estimation. Still, the method can be better employed in mass production industries with high volume and less variability of production. It is counter advised to use it for pharmaceutical industry and similar industries with specialty products.

Most times details in environmental data is more of a problem than the detail in monetary data. Environmental statistical system produces less sufficient data in certain countries than the monetary statistical system.

Scope3 accounting has high computational requirements, which calls for automation. SAP, the market leader business management company, offers “Carbon impact” a product for capturing Scope1, Scope2, and Scope 3 impacts. Similar solutions must become widespread in order to ease use of the methodology.

V. Hybrid accounting and social impact measurement

Recently the focus of sustainability impact measurement is slightly moving from environmental impacts towards social impacts. The use of hybrid accounting has been dominated by environmental impacts as far, but there is potential for measuring social impacts (e.g. employment), too. (see the triple bottom line analysis by Onat et al. 2014, or Ferrao et al 2014)

National social accounting is aware of the employment multiplier of a specific industry when it arrives at or departs from a region. Technically there is no difficulty at company level application, either. Evaluation of results is a kind of tricky. Employment and labour cost are an input indicator at company level, but output indicator at national level. Labour costs should be decreased in order to increase efficiency. At the same time employment should be increased at national level. While decreasing harmful emission can be translated to similar indicators and targets at micro and macro level, social indicators apparently conflict at micro and macro level.

VI. Conclusions

Hybrid accounting is an auxiliary tool, to be applied when no detailed physical data on emission are available. It should be applied with caution, especially when the homogeneity of technology across the sector is very far from reality. At the same time it is the only tool able to capture scope 3 impacts that account for some 75 % of all environmental impacts. For this reason, we cannot afford neglecting it, especially when we are interested in the magnitude of impacts.

We may suppose that application fields will transcend beyond strictly defined environmental impacts towards social impacts, including employment, diversity of workforce and equal payment. Such an application calls for balancing micro level and macro level goals and targets.

VII. Acknowledgement

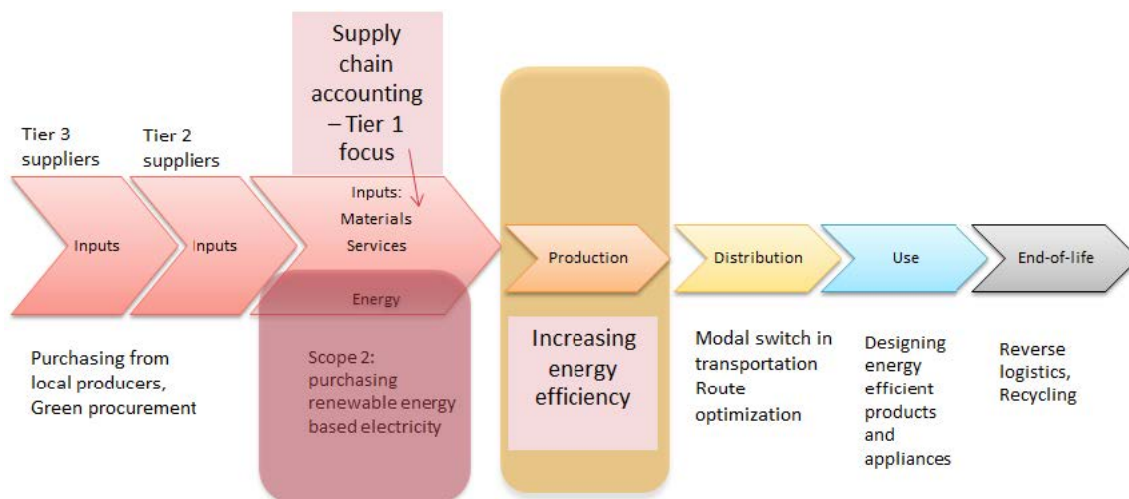
The authors are grateful to the OTKA 105888 Fund for supporting this research.

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FIGURE 1: CONTROLLING FOR SUPPLY CHAIN SUSTAINABILITY IMPACTS BASED ON SCHALTEGGER & CSUTORA (2012)



Measurement and valuation methodologies in sustainability accounting

Natural capital accounting

- **Brooke, Evison & Beagent:** Valuing Corporate Environmental Impacts: An introduction to PwC methodologies
 - **Christ & Burritt: Water Management Accounting:** A Framework for Corporate Practice
 - **MacNair:** Exercise for Assessing and Improving Sustainability Metrics
 - **Finisdore, Dvarskas, Rhodes & Landers:** Improving corporate performance with final ecosystem services
-

Social capital accounting

- **Hale:** Measurement in Sustainable Building
 - **van Bergen, Mckenzie and Mackintosh:** A New Vision of Value: Connecting corporate and societal value creation
 - **Maas: From Responsibility to Opportunity:** Measuring Social Impact to Maximise Social Return on Investment
-

Emerging issues and opportunities

- **Dodd:** Environmental and Sustainability Management Accounting for Sustainable Aviation Fuels
- **Fischer:** Qualitative minimum requirements as a first step in measuring sustainability
- **Tennojiya:** A Study of Material Flow Cost Accounting (MFCA) Diffusion: The Case of MFCA as a Production Improvement Tool
- **Thomas & McElroy:** The MultiCapital Scorecard

Valuing Corporate Environmental Impacts: An introduction to PwC methodologies

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Abstract: This short introductory paper is a preface to methodology papers which present PwC's latest thinking on the valuation of environmental impacts for corporate applications. Here we present the background to our approaches and our assessment of the current state of pre-existing research that are used by us and others for corporate valuation assessments.

I. Introduction

Our growing population, decreasing stock of raw materials and increasingly fragile natural environment are changing the world we live in. The business models of today are not equipped to deal with this change. How business operates in the future will need to be transformed. At the same time, what customers, suppliers, employees, governments and society in general expect from business is already changing.

There is an understandable desire for growth – to lift people from poverty, create jobs and improve wellbeing. But, there is also a growing recognition that we need the right kind of growth – good growth that is real, responsible inclusive and lasting.

From a responsible business perspective, this means considering the broader environmental, social, economic and fiscal impacts on stakeholders, beyond just shareholders, and making business decisions which optimise the impacts, while continuing to grow shareholder returns.

Key amongst these are business impacts on the environment (on natural capital) and the consequences of these impacts for human wellbeing, many of which are not currently reflected in market prices. The Environmental Profit & Loss (E P&L) is a tool which businesses can use to value these impacts on current and future populations.

II. What is an e p&l?

Ever since PUMA published 'the world's first Environmental Profit & Loss account' in 2010, E P&L has become a common shorthand for exercises which seek to estimate the value of environmental impacts associated with corporate activities.

The methods can be applied across sectors and to almost any scope – a whole enterprise and its value chain, a tier of the supply chain, a business unit, a product, an initiative or investment, a single production site, even a single material input.

The central purpose of any E P&L analysis is to provide more useful insight into environmental impacts

than would otherwise exist. To be useful, this insight needs to be credible and easily understood by decision-makers, it needs to be timely and therefore practical to produce and it needs to

be actionable. We, and organisations we have worked with, believe that E P&L results based on the methodologies we have developed ^[1] deliver these attributes for many potential applications.

Given that the use of E P&L as a tool is still evolving, its suitability to inform specific business decisions needs to be evaluated on a case by case basis with particular reference to the quality and resolution of environmental metric data. Linked to this, E P&L results need to be critically evaluated alongside other sources of decision support information. As suggested by the name, the E P&L only considers environmental impacts; it doesn't evaluate wider economic, fiscal and social impacts, and does not seek to provide a basis for truly holistic corporate decision making (see PwC's Total Impact Measurement and Management framework for an example of a holistic approach).

III. What impacts does the e p&l value?

The E P&L seeks to value the impacts on people resulting from changes in the environment associated with corporate value chains. These impacts can be positive (profits) or negative (losses). The values generated by an E P&L, therefore, represent an estimate of the change in wellbeing (or in economic terms 'welfare') experienced by people as a result of corporate environmental impacts.

We categorise impacts into six areas:

1. Air pollution: impacts on health, as well as on the natural and built environment.
2. Greenhouse gases: impacts on health, economy and the natural environment via climate change.
3. Land use and biodiversity: impacts associated with changes in ecosystem services.
4. Waste disposal: the release of GHGs and other air pollutants, leachate of pollution into water bodies and soils, and disamenity around disposal sites.
5. Water consumption: impacts on health, ecosystem services and the economy.
6. Water pollution: impacts on health and the natural environment.

IV. Why do companies value environmental impacts?

Some business models already deliver environmental benefits hand-in-hand with shareholder returns. By valuing these positive impacts the E P&L provides a means to recognise and reward them, and an incentive for more businesses to follow suit.

In most developed economies, clean air and water laws mean that companies (and ultimately consumers) already pay for some of the costs of pollution; but regulatory changes and stakeholder pressures are adding to these costs. For example:

- Increasing focus on enforcement coupled with new legislation in emerging economies;
- Growing employee awareness and expectations;
- Consumer pressure in relation to environmentally harmful products and production methods leading to changes in manufacturing and sourcing strategies;
- Local communities successfully suing major corporations for unlawful dumping of waste;
- Increasing incidence of droughts, floods, soil erosion and pests causing disruption to operations and price volatility in agricultural commodities.

These drivers are becoming more acute over time. So, although few of the costs estimated in an EP&L will currently hit the company's bottom line, they are strong indicators of future risks.

Together these pressures are increasing the attention from shareholders on how well companies understand and manage environmental risks and opportunities.

Monetary valuation of impacts provides a range of additional benefits to businesses, enabling them to:

- Simplify many complex environmental metrics into a single unit allowing for comparability, prioritisation and target setting;
- Improve cut-through and understanding with senior decision makers and provide a stronger basis for dialogue with other stakeholders; and
- Identify material opportunities to reduce impacts or develop new environmentally positive products and services.
- Connect different teams and data owners within the business and get new functions and decision makers to engage with environmental information;
- Broaden and deepen understanding of environmental impacts along the whole value chain; and,
- Establish or enhance comprehensive environmental datasets across a wide range of impact areas.

V. How do we value corporate environmental impacts?

There are three steps to estimating the scale of corporate environmental impacts (Figure 1).

1. The first step is to quantify environmental emissions or resource-use in biophysical units (kilograms, litres, hectares etc.).
2. The second step is to understand how the corporate emissions or resource-use cause changes in the natural environment.
3. The final step is to value the impacts on people associated with these changes in the environment.

Traditional environmental reporting typically stops at the first step, providing an understanding of the magnitude of emissions and resource use; the E P&L goes further to also consider the consequences of these emissions and resource use for the environment and people.

A wide range of methods exist to measure or estimate biophysical quantities of emissions or resource use and are the subject of separate documentation. The E P&L valuation methodologies address the second two steps.

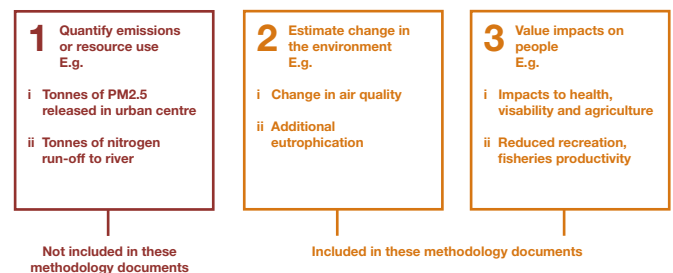


FIGURE 1: THREE STEPS TO ESTIMATING AND VALUING IMPACTS.

Each methodology paper explains steps two and three in detail for the relevant impact area.

As we developed the methodologies we used a set of basic methodological principles to guide our decision-making:

- **Completeness:** Each methodology should aim to cover more than 90% of the value of impacts, as identified in our impact pathways.
- **Consistency:** Apply a consistent conceptual framework based on the theory of environmental and welfare economics; follow a consistent impact pathway approach to understand causality; apply common assumptions and datasets across different methodological areas.
- **Practical and 'fit for purpose':** Directly linked to environmental metrics which corporates can feasibly measure; able to produce approximate results based on limited data; sophisticated enough to produce more accurate results in more data rich situations.

- Location specific: Taking into account the huge spatial variation in the value of ecosystem services and environmental impacts, the approaches are designed to be applicable at specific location, region or country level, dependant on company and contextual data. To deliver consistency in multi-scale assessments the approaches are designed to be ‘nested’ such that results for a specific location are compatible with results produced at a broader scale.
- Best available approaches: Assimilate and build on existing (peer-reviewed) methods wherever these exist and can reasonably be adapted for application to corporate impacts.
- Transparency: Provide clarity on sources and methods; highlight limitations and areas for further development.

VI. Areas for further development

None of the E P&L methodologies is perfect and all would benefit from further research and refinement. Specific limitations are identified in each of the papers and below we have summarised some more general areas for development. We welcome feedback as we continue to refine the methodologies.

All of the methodologies assimilate and build on existing research. In some cases this research has limitations in either the scientific understanding of the impact pathway, or the economic valuation of the impacts on people, or both.

Table 1 below summarises our assessment of the overall ‘robustness’ of the methods employed in each impact area considering:

1. The extent and quality of the academic literature which underpins it;
2. The degree of consensus in this underlying literature; and,
3. The applicability of the underlying literature to the measurement or valuation of corporate environmental impacts.

We have split this assessment into two parts: The ‘science’ (step 2 in Figure 1) – understanding how emissions or resource use change the environment, including how these changes affect people. And the ‘economics’ (step 3 in Figure 1) – valuing the consequences of environmental changes for people. Brief notes on the rationale behind these ratings follow.

Impact area	Science	Economics
Air pollution	5	4
Greenhouse gases	5	4
Waste	4	4
Land use	3	3
Water consumption	3	2
Water pollution	2	3

FIGURE 2: SUMMARY ASSESSMENT OF ‘ROBUSTNESS’ (CONSIDERING EXTENT OF LITERATURE, DEGREE OF CONSENSUS AND APPLICABILITY); 6= MOST ROBUST;

1 = LEAST ROBUST

Notes on our robustness ratings:

Air emissions

- Highly advanced scientific literature with clearly defined causal pathways from emission, through dispersion, to dose-response and specific health endpoints.
- Advanced economic literature on the valuation of health impacts, although variation in estimates produced. More limited research on non-health impacts.
- International institutions (like the OECD and World Health Organisation) have published guidance on quantification and valuation of impacts, and many governments use estimates in policy making (e.g. see EU ExternE study, UK Defra damage costs, ^[2,3]).

Greenhouse gases

- Highly advanced literature on the science of climate change led by the International Panel on Climate Change (IPCC).
- Owing to the level of international policy attention the future costs of climate change have also been extensively studied. While there is significant variation in estimates, much of this variation revolves around points of theory and ethics (e.g. discounting) rather than the nominal values themselves.
- The use of a social cost of carbon (SCC) is now common place in policy analysis and many governments and some businesses now have an approved SCC for use in decision-making.

Waste

- The principal impacts of waste are associated with GHGs, and in some instances disamenity, leachate, and air pollution. GHGs and air pollution both have advanced scientific and economic literature.
- Disamenity and leachate are both relatively well studied in developed economies but they are highly context dependant – generalised models require significant simplifications.

Land use

- Advanced ecological literature on the impacts of land conversion and on-going use on the provision of ecosystem services. But more limited understanding of role of biodiversity in the delivery of ecosystem services.
- Valuation of ecosystem services is a rapidly developing field in academia. Consistent globally applicable assessments are hindered by the relatively limited body of peer-reviewed literature. There are also significant challenges in aggregation and generalisation given the

degree of spatial variation in value estimates.

- The valuation of ecosystem services is increasingly being integrated into policy making. For example, the UK National Ecosystems Assessment^[4] considers the value of ecosystem services under different land use planning scenarios.

Water consumption

- The science is well understood and trends are observable in well-maintained global databases on water use and water-borne disease (e.g. UN Water and the FAO's AquaStat).
- The valuation of impacts draws largely on the valuation of health and life, which has an advanced literature underlying it and is used by policy makers and international institutions for decision-making.
- However, demonstrating causality between corporate water use and additional human impacts has not been the focus of work in this area to date, and is difficult given the number of context-specific variables influencing impacts. There are some useful studies in the Life Cycle Analysis literature, but even the most sophisticated benefit transfer is unlikely to be a good substitute for detailed primary research where site specific detail is important.

Water pollution

- Epidemiological research into human toxicity impacts in controlled experimental conditions is good. However, outside controlled conditions impacts are highly uncertain due to difficulties in estimating emission-receptor- impact pathways.
- The valuation of impacts draws largely on the valuation of health and life, which has an advanced literature underlying it and is used by policy makers and international institutions for decision-making.
- The valuation of non-health impacts associated with eutrophication is mostly studied using willingness to pay analysis for improved water quality in developed countries. There has been limited work considering these impacts in developing countries.

Data availability

In the interests of making the approaches practical to apply and delivering the desired consistency across diverse locations we have favoured methods that can be applied with readily available data. As a result it has sometimes been necessary to compromise on points of theoretical purity or the granularity of analysis. For example, in some areas we have found it necessary to employ cost-based value estimates as proxies (in lieu of welfare derived alternatives), and some input datasets are only available in a consistent form at a state or country level making more granular analyses difficult.

Non marginal impacts

Many of the E P&L values reflect an implicit assumption that the environmental changes caused by any individual business are marginal relative to the current state of the environment. In reality, non-linearities and threshold effects mean that this condition may not hold and identifying ways to take this into account would be an important, if challenging, area for further work.

Known omissions

As noted in the first chapter of each paper, specific impact pathways are sometimes excluded. Generally this is done on the basis that they are expected (or known) to be immaterial for most applications.

In addition, some classes of environmental impact are not covered by these methodologies – for example, noise and light pollution, radiation, littering (of land, water and oceans) and indoor environmental impacts. Depending on the specific application it may be helpful to include some of these where they are likely to be material.

VII. Conclusions

With currently available peer reviewed literature and information the E P&L provides many benefits to companies looking to better understand their impacts on the environment and society as well as prioritise and shape strategies to address these.

Organisations we have worked with identify a range of benefits; from the obvious, that it enables comparison and prioritisation between diverse impact areas and can be used to communicate the true environmental costs and benefits of business activities; to the less obvious – that it can improve environmental understanding across a business, and put environmental information on the boardroom agenda.

However, all of the E P&L valuation methodologies would benefit from improved peer reviewed research. . As companies become more familiar with the monetisation of environmental impacts so the demand for better underlying research will grow.

We welcome feedback as we continue to develop the methodologies.

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Water Management Accounting: A Framework for Corporate Practice

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Abstract: Water initiatives for business and in business have ballooned in the 2010s and the challenge is how to provide the best accounting for water scarcity, water surpluses and water management opportunities. Water management accounting (WMA) is a recently proposed extension to Environmental Management Accounting (EMA) designed to support corporate management decisions and improve both economic and environmental water-related business outcomes.

I. Introduction

Environmental management accounting (EMA) was developed in the 1990s to highlight the decision settings, tools and types of information different managers need to manage the economic and environmental aspects of their business activities^[1]. Although EMA has previously been extended to consider specific elements of environmental importance, such as carbon, an explicit focus on corporate water management is only a recent development. The lack of previous attention is remarkable given water is an important part of natural capital required to support ongoing corporate activities. In addition, water risks and opportunities both have financial and physical aspects and an integrated system of corporate water accounting which jointly considers the significance for decision making in relation to the supply of and demand for water could bring together strategic monetary and physical information for practical management purposes^[1]. Water management accounting (WMA) is a recently proposed extension to EMA designed to support corporate management decisions and improve both economic and environmental water-related outcomes for business^[2].

II. Water accounting initiatives

The last decade has seen a number of corporate water tools developed. A helpful publication from the World Business Council for Sustainable Development^[9] reviews 18 currently available tools and initiatives. The publication was designed to support development of a common language for addressing corporate sustainable water use, the fundamental purpose being to 'to advance understanding of how tools can be combined to yield a practical and effective approach to corporate water management'^[9]. WMA extends this early work by providing a comprehensive framework which combines such tools along four dimensions for decision

making about performance: whether the information is primarily physical or monetary in nature; time frame – whether the information relates to past, current or future activities; length of time frame – whether the focus of the specific tool is on short- or long-term decision making; and the routineness of the information collected – whether the information relating to specific EMA tools is routinely generated or whether it relates to ad hoc, decisions based on specific needs.

Each of these initiatives is analysed in Table 1 in terms of these framework criteria and a number of observations can be made.

The majority of water initiatives are very recent, coming into effect in the 2010's, which reflects upon the sea-change in opinion and desire from different groups to get businesses (and other organisations) to incorporate water-related thinking about supply and demand costs and opportunities in their strategies and practices.

Many of the initiatives remain in the process of development, but there is a growing need for best practice to emerge in order that the plethora can be harmonized for business to be able to minimize the costs of certification, standardization and guidelines in relation to water.

Variety in the scope of the initiatives reflects the emerging concerns at product and process levels, site and corporate accounting, supply chain and catchment entities.

Target audiences include a mix of external users of reports (e.g. GRI water Performance Indicators), and a combination of internal and external decision makers (e.g. UNEP Finance Initiative: Chief Liquidity Series). Of interest is that not one of the tools focuses just on internal decision making. This demonstrates the importance of external stakeholders in the current corporate water accounting debate. Internal management decisions seem to have a subsidiary role in so many of the initiatives. On the face of it reporting in many initiatives is seen as driving internal management. Such an outside-in approach to water management accounting is likely to fall short of the inside-out business case for thinking about water promoted through effective internal management^[14].

Many initiatives are orientated towards externally reported information while EMA looks towards support for management decision making. Such tools can still be categorised using the EMA framework dimensions as even though a tool is externally focussed it generates information that can be used

for internal decision making. Improved water management/ outcomes will only arise through internal management efforts, even though these may sometimes involve collaboration with external parties, and internal EMA information can be used as a rich source to support accountability to external parties but the key focus is on adaptive capacity and action not disclosure ^[20].

In contrast with the EMA framework many of the water initiatives focus solely on the acquisition of physical data, for example water footprints, with a notional reference to the business case, or monetary information (mostly costs but sometimes opportunities), and rarely touch on the notion of eco-efficiency (corporate or sector) which brings environmental and monetary performance together ^[11], ^[12].

An important observation given the rapid development of communication technology is that several WMA initiatives are already, or plan to be, based on real-time disclosure, based on interactive (user with computer) ^[10], monologic (user to external stakeholder) input of data. However, some initiatives focus solely on gathering past data (described as current) (Water Stewardship Australia Ltd).

Sustainability issues involving water might be expected to have a long-term orientation ^[13] (e.g. Water Use Assessment within Life Cycle Assessment), but from a decision making perspective many initiatives in relation to water take a short run, periodic approach to information. Note for example that respondents to the Carbon Disclosure Project's questionnaire feel that water risk is something they need information about in the short run because one third believed the negative impacts associated with this risk would materialise within the next

12 months ^[8]. Managers need a seamless interface between decisions about the series of short runs from which sustainability actions occur and the long run in which integration of the environmental, economic and social emerges. Hence, the large number of initiatives addressing both the short and long runs is a positive outcome and encouraged by the EMA framework.

Finally, tools have been devised, such as the GEMI Local Water Tool™ which can be used in an ad-hoc manner when the need arises, this also being a characteristic of interactive tools as well, while others eg European Water Stewardship Standard, require routine, periodic gathering of data over time..

III. Value added from wma

The value added from WMA is, first, common to all the current cohort of water initiatives it provides a decision framework which voluntarily increases awareness as a foundation for action to be taken towards water-related risk reduction and opportunities using available tools. It does not rely on regulation to achieve its aims.

Second, the WMA framework encompasses a comprehensive set of management decision settings within which tools for management decision making fit. Some of the current set of initiatives examined do or can act as tools to support managers with certain decision settings in which they might find themselves. But in general they do not engage with this purpose. Rather they are driven by external disclosure with decision making as a sideline. WMA highlights the need to identify specific decision settings and the water-related information of relevance managers whose roles incorporate responsibility for such decisions.

Third, where the initiatives do address management decision making and are integrated with disclosure there is a need for harmonized communication to avoid duplication e.g. Water Stewardship Australia Ltd and Alliance for Water Stewardship, and the sets of water footprint orientated initiatives. The CEO Mandate identifies this need ^[15] which would balance the need for WMA tools to be developed to help managers with an inside-out voluntary integrated water management process, and reduce the current over-focus on disclosure.

Fourth, WMA always relates to a business case for actions of corporate management and this means it integrates economic and environmental performance with the intent of improving both by creating value for the business which can be spread between its stakeholders. But there is a real possibility that trade-offs will be needed unless constant, dynamic innovation can carry the day through internal planning and mitigation ^[16]. By having a singular focus on water some of the recent initiatives, although well intentioned play down the importance of the economic success dimension and lose relevance/ balance for business which apart from better water management is looking for increased sales, cost savings, an improved competitive position, higher margins and better profitability ^[17]. A question arises as to how such a tendency might be overcome and it is suggested that WMA might serve as an integrative framework for such a task. The framework is designed to deliver information to different managers with different responsibilities and different information needs to fit their particular roles ^[14] but the business case remains a driving force. Devising a business case for a sustainability-orientated dynamic business model might bring the focus back necessary action ^[15].

IV. Conclusion

The challenge raised here for each business is how accounting can best establish a comprehensive foundation for addressing the need for taking on the challenges of water scarcity ^[18], water surpluses ^[19] and water management opportunities. A greater focus is needed on where action is taken by managers, with a special emphasis on corporate managers at all levels.

TABLE 1: COMPREHENSIVENESS FOR DECISION MAKING OF WATER INITIATIVES

Water accounting initiative	Start Date/ Standard or Guidance	Scope	Target	Environmental Management Accounting Decision Information			
				Physical/ monetary	Past, current / future activities	Short / long term focus	Routine / ad hoc
Alliance for Water Stewardship	2009	Site, Catchment	External	Physical Monetary	Past Future	Short term Long term	Routine
BIER Water Footprint Working Group	2011	Site Corporate, Supply Chain	Internal/ External	Physical	Past	Long term	Ad hoc
CDP Water Disclosure	2009	Corporate	External	Physical Monetary	Past Future	Short term	Routine
Ceres Aqua Gauge	2011	Corporate	Internal/ External	Physical Monetary	Past Future	Short term Long term	Regular Ad hoc
European Water Stewardship Standard	2011	Site	Internal/ External	Physical Monetary	Past Future	Short term Long term	Routine
GEMI Local Water Tool™	2012	Site	Internal/ External	Physical Monetary	Past Interactive	Short term	Ad hoc water tool
GRI Water Performance Indicators	2002	Corporate	External	Physical	Past	Short term	Routine
ISO Water footprint: Requirements and Guidelines	2014	Products, processes, organisations	Internal/ External	Physical	Past	Short term Long term	Routine
UN CEO Water Mandate	2014	Corporate	External	Physical	Past Interactive Planned	Short term Long term	Routine
UNEP Finance Initiative: Chief Liquidity Series	2009	Corporate Sectors	Internal / External	Physical Monetary	Past Future	Short term Long term	Ad hoc
Water Accounting: An Australian Framework for the Minerals Industry	2005	Site	Internal/ External	Physical	Past	Short term Long term (planning)	Routine reporting
Water Footprint Network	2009	Products, processes, organizations	Internal/ External	Physical	Past	Short term Long term	Ad hoc
Water Impact Index	2011	Product, Processes, organizations	Internal/ External	Physical	Past Interactive	Short term Long term	Ad hoc
Water Risk Filter	2014	Corporate	External	Physical Monetary	Past Online Future	Short term	Ad hoc
Water Stewardship Australia Ltd	2014	Site Catchment	External	Physical Monetary	Past Future	Short term Long term	Routine
Water Use Assessment within Life Cycle Assessment	2008	Product, Processes, organizations	Internal/ External	Physical	Past	Long term	Routine Ad hoc
WBCSD Global Water Tool	2011	Site	Internal/ External	Physical Monetary	Past	Short term Long term	Ad hoc water tool
WRI Aqueduct	2010	Site	Internal/ External	Physical	Past Interactive Future	Short term Long term	Ad hoc water risk atlas

		Monetary EMA		Physical EMA	
		Short-term	Long-term	Short-term	Long-term
Past oriented	Routinely generated	Env. cost accounting (1)	Env. induced capital expenditure and revenues (2)	Material and energy flow accounting (9)	Env. capital impact accounting (10)
	Ad hoc	Ex post assessment of relevant env. costing decisions (3)	Ex post inv. assessment of projects (4)	Ex post assessment of short-term env. impacts (11)	Ex post inv. appraisal of physical env. investments (12)
Future oriented	Routinely generated	Monetary env. budgeting (5)	Env. long-term financial planning (6)	Physical env. budgeting (13)	Env. long-term physical planning (14)
	Ad hoc	Relevant env. costing (7)	Monetary env. inv. appraisal (8)	Tools designed to predict relevant env. impacts (15)	Physical env. inv. appraisal (16)

FIGURE 1. COMPREHENSIVE EMA FRAMEWORK
 SOURCE: ^[1] DARK GREY BOXES ILLUSTRATE A SPECIFIC APPLICATION OF TWO TOOLS FROM THE 16 POSSIBLE DECISION SETTINGS.

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Assessing and Improving Sustainability Outcomes

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I. Introduction

Sustainability outcome¹ metrics typically describe the impacts companies have on the environment in terms of air quality, water quality, or waste management. There is an enormous suite of tools and approaches for calculating and reporting these metrics, including the Global Reporting Initiative and the recently released Carbon Disclosure Standards Board framework for reporting environmental information and natural capital impacts.

One challenge with the existing suite of tools is that sustainability outcome metrics are often descriptive and may not be actionable because they do not provide information to drive corporate decision making. The practical value of such metrics, especially at the project level, is unclear to companies.

This paper describes a framework that helps companies determine which sustainability outcome metrics can improve their internal decision-making, and how the value of sustainability metrics can be quantified. In particular, we focus on the important role that project context has in making good sustainability decisions. These project level decisions may sometimes be at odds with the high level priorities that drive corporate sustainability reporting.

The framework should be of interest to companies, consultants and academics because it demonstrates a practical approach for evaluating sustainability metrics and determining which ones are most valuable.

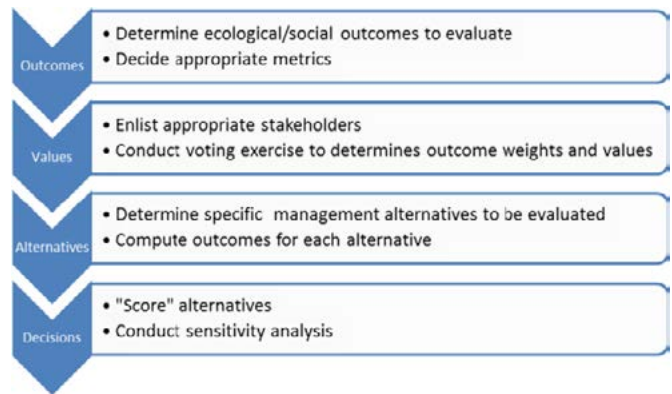
II. Decision framework

The framework for this paper integrates two decision support tools. First, the Ecosystem Services Identification and Inventory (ESII) tool, which is being developed collaboratively by The Dow Chemical Company, The Nature Conservancy, and EcoMetrix Solutions Group. ESII enables corporations to understand the delivery of ecosystem services in quantifiable units, and therefore helps them to understand the relative benefits produced by different management alternatives at a site.

The Natural Capital Decision Analytics (NCDA) tool, built by ERM, provides a robust framework for corporations to systematically evaluate project or program decision alternatives based on the environmental and social metrics that are most important to decision-makers.

¹ In this paper, sustainability outcomes refer to the benefits that people receive from nature (and how a company's actions affect these benefits).

The broad steps for using the combined framework are:



III. Decision context - illustrative project location decision

We illustrate the framework using a simplified, illustrative project.

Background

IMC is a global manufacturer of specialty equipment for manufacturing supply companies. Because of increased demand for its specialty products, IMC is planning to build a new manufacturing plant in Eurasia. It has already received preliminary government approval to build the facility; the major remaining issue is whether to build the facility near a wetland (Site W) or a forested area (Site F). The facility will be located in an area that is currently undeveloped, about 100 kilometers from a mid-sized city. The general area is rich in the types of mineral resources that are needed by the facility and the project will represent a significant commitment of capital. Both locations will have impacts on the local environment and on local communities that depend on the ecosystems. There has been controversy and conflict about development in the area and associated impacts on the local population.

IMC needs to determine where to build the facility and secure final government approval. IMC recognizes that securing approval will require a well-documented analysis of the environmental and social impacts of the choice of location. It also wants to assure that the choice is consistent with its sustainability goals, and the need to operate a financially sustainable facility.

IMC wants to understand the impact of the alternative project locations on specific environmental and social outcomes and the relative importance of each outcome in reaching a decision.

FIGURE 1



Project Details

The project site and its vicinity are comprised of grassland and other uplands, and a large wetland area bounded by forest along the south side and by steep hills to the north and west. The wetland drains off the site to the east, becoming a creek that flows into canyons as it makes its way downstream. The region in which the project site is located is mostly grass and shrubland with few large forests. There are numerous farming communities in the general vicinity of the project site. These villages rely on the project site and its surroundings for a variety of resources, including:

- **Grazing** – Shepherds from nearby villages use the site for grazing sheep and cattle. The shepherds from the three surrounding villages all have a traditional route and timing for moving their livestock through the site (see Figure 1).
- **Wood Gathering** – The forest area is a source of firewood for local communities. Although cutting trees is restricted, villagers gather the available downed wood from the forest as a supplemental fuel source. Four villages are largely dependent on the forested area for their fuel.
- **Fishing** – The wetland area is fed by springs above the site. As this water leaves the site, it joins additional springs to create a moderate sized creek. All the villages use the creek to supplement their food sources, and one village is particularly dependent on the fish.
- **Water supply** – The creek and nearby springs are the water source for several of the villages. Site W would have a limited impact on the supply of water within the basin due to surface water withdrawals. However, the changes to the system will potentially have much greater water use impacts since the project would adversely affect the timing of the runoff by impacting an area that currently provides considerable subsurface storage and replacing it with an impervious surface that will result in immediate runoff.
- **Cultural** – The spring that flows into the wetland from above the site are consecrated waters. The spring bubbles up into a small Greek Orthodox chapel where it is collected before flowing out and into the wetland (see Figure 2). The chapel is shared by all of the local villages

- **Food** - The forested area provides forage opportunity for nuts, berries, and mushrooms. The forage areas for the villages closely match the fuel gathering locations for the respective villages. The foraging activities provide approximately 10 percent of the daily food needs for the villages.
- **GHG Emissions** – Site F would require more electricity because of the need to pump groundwater. Site W is closer to a river and the facility could use surface water.
- **Protected species** - Site W has no species of concern associated with it, being comprised primarily of native grasses. The forest is protected in part because of the presence of Krueper’s Nuthatch (*Sitta krueperi*), a species listed as a near threatened on the IUCN 3.1 list.

FIGURE 2



IV. Framework implementation

A. Outcomes and metrics

Identifying and evaluating sustainability outcomes is an iterative and context-specific process that involves both corporate stakeholders and technical experts. Relevant factors include data availability; company policy and values; and the extent to which alternatives will produce different outcomes.

By far, the most challenging part is making sure that we use outcomes and metrics that can ultimately be used to reflect the value of ecosystems to people. For example, a direct ecological metric for assessing the impact to fishing would be the effect on local fish population or habitat, but the number of people affected by the change in fish population is what we need to value. Developing the appropriate ecological understanding is a two-step process:

1. Recognizing the ecological consequences of the project;
2. Understanding the relationship between change in ecological systems and the benefits provided to people.

Step 1 involves consideration of what features on the landscape are being changed (e.g., type of vegetation, soil composition, water features, or topography) and correlating those changes with the ecological processes performed on the site. Based on the level of decision-making required, these correlations can range from general estimates based on a common understanding of ecology, to specific quantified estimates based on ecological models.

Step 2 provides insight into how ecological changes impact the benefits that people receive from nature.

The ESII tool provides a user-friendly way of applying this two-step process. It uses a relatively simple data sheet that allows the data collector to choose between pictures of different site and landscape conditions for a variety of landscape variables. The ESII tool will then quantify the correlations described above to provide the resulting changes in outcomes, such as water supply.

Through the two-step process, an analyst can gain a better understanding of what outcomes will be lost, why they will be lost, and how that loss can be mitigated.

B. Values

This part of the framework determines how corporate stakeholders ‘value’ each of the sustainability outcomes. This does not rely upon monetary values to measure the outcomes. Instead, we convert a range of heterogeneous information and metrics into a format which helps decision-makers. Basically, the framework creates “exchange” rates among the outcomes so that they can be aggregated and compared.

The NCDA tool estimates the value (or weight) of the outcomes through a voting exercise. The voting takes place during a meeting/workshop/webinar among appropriate corporate stakeholders. The exercise is a combination of focused conversation and statistical modelling that allows participants to quickly arrive at a consensus about which outcomes are important and the relative weights to use in comparing alternatives.

C. Alternatives Analysis

ESII also allows for the comparison of alternative project locations. Initial data can be used to generate a set of baseline outputs, and these can be compared to outputs based on alternative facility sites (in our example, Site W or Site F). Each location is modeled to predict change in landscape features based on the changes to site-level data associated with the proposed facility (step 1 above). The corresponding changes to human benefits (step 2) can then be considered.

D. Decisions

The alternatives identified from the previous steps are then ‘scored’, based on their total impacts across all of the

outcomes. ESII/NCDA is not prescriptive and does not tell decision-makers which alternative to choose. Instead, it provides a focused approach for evaluating and determining the appropriate path forward.

V. Results

ERM and ESG conducted an interactive workshop to evaluate the sustainability outcomes and metrics of the illustrative project. The workshop was attended by technical experts in topics including ecology, economics, water resources, and cultural heritage. The participants evaluated a variety of outcomes and metrics, and participated in the voting exercise. The voting results indicated that the participants collectively value Site W more than Site F (Figure 3). In this case because it has fewer negative impacts. The impact on forest products was the largest negative impact. However, the sensitivity analysis showed that when the weight for forest products had a significant impact which alternative has the least impact on natural capital (Figure 4). Therefore, additional discussions, possibly with external stakeholders about mitigation activities may be warranted.

FIGURE 3 – NATURAL CAPITAL SCORES FOR SITES F AND W

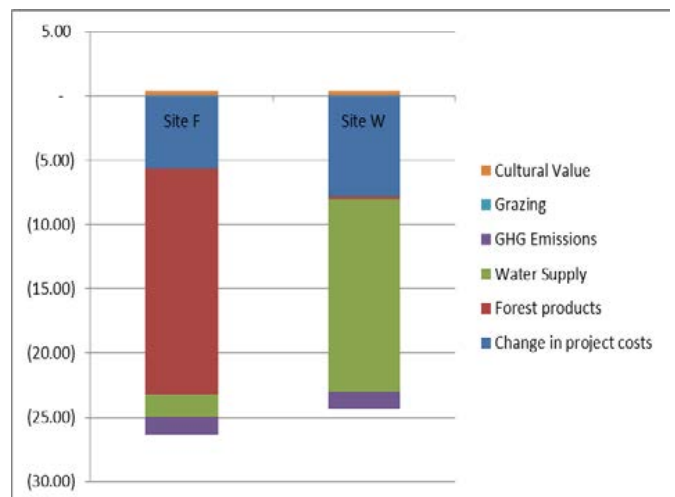
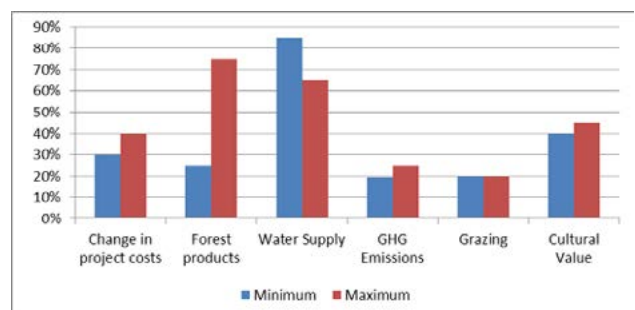


FIGURE 4 – SENSITIVITY ANALYSIS FOR WEIGHTS FOR SITE F



VI. Discussion

The results for the illustrative project are consistent with our experience with actual projects. Our general findings are:

1. When selecting metrics to measure impacts on the environment and local communities, decision makers rarely select monetary measures. While they obviously focus on the financial impacts to the company, most decision makers struggle with using monetary values of other outcomes, such as forest products, grazing, or cultural values. This is because of the challenge of reliably estimating monetary values (especially at the local level and for outcomes such as cultural values) and the difficulty of putting monetary values in context. Knowing that the value of forest products lost in \$X may be less important than knowing that 200 people will lose their primary source of income.
2. The ecosystem and social metrics used by decision makers at the project level are often vastly different from common high level sustainability metrics. While decision makers are often very concerned about these broad metrics, they choose to focus on outcomes that can be related directly to the issue at hand and use metrics they understand.

However, these two observations provide some significant challenges for measuring sustainability and, by extension, natural capital. First, "home-grown", project-specific values can be beneficial and appropriate because they reflect local context and information. However, they can also lead to biases based on local decision maker assumptions, preferences, and experience. Moreover, the extent to which these biases exist and whether home-grown values reflect corporate values is difficult to assess. Decision support tools, such as NCDA/ESII can be valuable because they incorporate best practices from both ecological and the decision analysis fields. Quantitative tools can help reduce the biases and make them easier to see and address by making them explicit

Second, while high level dashboard metrics may be useful and necessary for corporations desiring to report out to the public, real sustainability planning is the cumulative consequence of many project level decisions. Accordingly, if companies want to make better, more informed and consistent decisions, it is important that the high level dashboard metrics incorporate the attributes and benefits that affect project level decisions. However, even the best traditional methods for rolling up disparate outcome metrics, monetary values, are not sufficiently reliable for measuring environmental and social outcomes.

VII. Conclusion

The decision support framework described in this paper can help companies systematically explore which sustainability outcomes are of most value to them, and diverge from the traditional suite of sustainability metrics. Together ESII and NCDA can provide: a more rigorous basis for understanding who benefits from environmental changes and why; guidance on how to construct new alternatives that might provide increased total benefits; and insights into the areas where reducing uncertainty will be most valuable.

Improving corporate performance with final ecosystem services

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Abstract: Ecosystem services are material to business performance but managers are not getting their full benefits due in part to weaknesses in commonly used classification systems. The “final ecosystem services perspective” embodied by the Final Ecosystem Goods and Services Classification System (FEGS-CS) [1] and the National Ecosystem Services Classification System (NESCS) [2] resolve bottlenecks to mainstreaming ecosystem services in corporate decision making.

Compared to other systems, these are arguably easier to use, improve materiality analysis and aid stakeholder engagement. Their ability to improve valuation makes them preferable for natural capital accounting

I. From groupings of services to an effective system

With the launch of the 2005 Millennium Ecosystem Assessment (MA) [3], four groups of ecosystem services were promoted:

- Provisioning services, goods or products (e.g. water, timber) for human consumption
- Regulating services, benefits from control of natural processes (e.g. erosion control, pollination)
- Cultural services, nonmaterial benefits (e.g. recreation, inspiration)
- Supporting services, natural processes that sustain other ecosystem services (e.g. nutrient cycling)

The MA did not propose this grouping as a formal classification system [3]. Still, numerous standards including The Economics of Ecosystems and Biodiversity [4] and The Common International Classification of Ecosystem Services [5] draw directly from it. In turn, corporate guidance documents refer to these and similar classification systems in publications such as the Corporate Ecosystem Services Review [6] and the IFC Performance Standards [7].

After the MA's launch, economists began advocating for further differentiation of ecosystem services into ecosystem processes and functions („intermediate ecosystem services”) and „final ecosystem services” (FES) [8]. Their interest stemmed in part from the steps necessary to translate components of an ecosystem into a „service” that directly impacts well-being. For example, for a fish to make it to

market, a boat, fishing supplies, fuel and labor are needed in addition to a ready stock of fish. The fish depend on numerous environmental functions, from habitat quality to nutrient cycling.

MA-based classification systems consider multiple points along a production function continuum to be ecosystem services. FES, however, are defined at the point where the environmental service transitions from being predominately ecological to being a benefit provided as a result of mixing with manmade capital. In this example, that transition point occurs when the fish is catchable by the fisher. The transition point is also determined by who is using the service. A farmer benefits from the soil, water and air on her farm, while tourists value that farm's aesthetics.

These principles—(1) focusing on the transition point and (2) noting the beneficiary at that transition point—can be considered the „final ecosystem services perspective.” When applied to classification systems, as with the FEGS-CS and NESCS, it helps to:

1. Eliminate double counting. MA-based classification systems may direct one to measure soil carbon, native habitat and crops. The first two regulating ecosystem services are often subcomponents of the provisioning ecosystem service, crops. When valuing these ecosystem services, soil carbon and native habitat would likely double count ES values. A FES-based classification system would focus on measuring the ecological production function (e.g. how soil nutrients contribute to crop production) separate from the economic production function (e.g. human management of the crop), avoiding double counting.
2. Make more efficient analytical choices. Clearly stating the beneficiary, for example between „water for a farmer” versus „water for manufacturing” allows practitioners to immediately consider the most appropriate ecological modeling and valuation techniques.
3. Improve stakeholder engagement. By defining FES as directly used or appreciated by humans, ecological contributions to welfare are more readily understood, providing an accessible common language among experts and non-experts from different disciplines.

These three improvements should aid the integrating of ecosystem services into corporate decision making.

II. Applying the FES perspective

Desk and field applications highlight the advantages and challenges for managers adopting the FES perspective.

NATURAL CAPITAL ACCOUNTING

Working papers on natural capital accounting mention final ecosystem services, noting the advantages of avoiding double counting and identifying beneficiaries [9-10]. One example from these papers values food, recreation, and climate regulation services from a site. FECS-CS would eliminate carbon sequestration from the list of FES—moving it to the environmental accounts. It would also remove the capital and labor associated with food production, favoring measures of soil, water and air ecosystem services directly used by the farmer.

REPORTING

Some experts caution that the FES perspective could increase reporting requirements [11]. However, applied properly, it should reduce burdens.

Natural capital reporting could be reorganized into three groups. The first would use the mitigation hierarchy [7] as a basis for defining and disclosing material impacts on species and ecosystems. The second group would report on benefits from FES. The third group would disclose the implications of natural capital impacts and dependencies on „ecosystem resiliency,” capacity of an ecosystem to tolerate disturbance [12]. Managers already do this with the FES of water, where the water’s resiliency is akin to water stress [13].

For example, a real estate firm could report how their assets are protected from natural disasters. A component of this protection would come from the resilience of the FES „regulation of extreme events” that reduces natural disaster impacts. This green infrastructure may contain species of concern not associated with “natural disaster reduction” production functions and therefore need to be disclosed separately.

CERTIFICATION

Most product certification systems measure both intermediate and final ecosystem services without distinction [14]. Generally, they refer to ecosystem services that are used by communities. However, FECS-CS and NESCS would not classify many of these as FES. Making the FES approach standard could sharpen definitions within certification systems, providing clearer guidelines to farmers, for example, on what they need to do on their farm to increase community benefits.

For example, the ecosystem services of non-timber forest products (NTFPs), water, soil carbon and cultural values would be simplified into the FES of NTFPs, water purification and cultural values. Soil carbon would be classified as an ecosystem function related to soil management.

IMPACT ASSESSMENTS AND OFFSETS

Impact assessments use the mitigation hierarchy to help manage biodiversity and ecosystem service risks [7]. Similar to certification, the FES perspective would bring clarity, distinguishing between threatened species, ecosystems, and the services they provide. This would:

- Largely eliminate the supporting and regulating ecosystem services, clarifying that FES must connect ecosystems to humans
- Make beneficiaries a larger part of assessments earlier in the process

Grupo Argos used FECS-CS to help organize a sites’ existing biological research. It yielded clear, compelling risks to the firm [15]. ERM, the consultancy, developed an ecosystem services decision tool in Maine, finding the FECS-CS call for a focus on beneficiaries helpful [11].

III. Conclusion

FES-based classification systems will likely prove easier to integrate into existing business processes than the alternatives. FECS-CS and NESCS are less confusing than alternatives [11]. For example the FES perspective:

- Fits better into business processes – regulatory compliance processes typically measure pollutants and FES focus on how pollutants affect well-being
- Is similar to aspects used in strategic planning and reporting (e.g. water used by the company), easing integration of environmental data into planning and communication
- Is easier to understand than MA-based systems [11]
- Focuses valuation efforts, reducing uncertainty and creating greater consistency between corporate and public ecosystem services accounting

There are challenges with FES. Any system must prove relevant to managers and a flexible approach is encouraged. This will allow learning to occur over time [16]. Like other ES assessment tools and approaches, the FES perspective requires large quantities of quality data and complex ecological modeling that are as yet in short supply.

The FES perspective embodied in FECS-CS and NESCS likely provides corporate managers an improved system for mainstreaming ecosystem services into decision making. One, it helps reduce overlap of ecological and economic production functions in analysis. Second, it identifies beneficiaries early in analysis, emphasizing the value to humans of benefits from the environment. However, data and modeling challenges will remain, calling for a measured transition to the FES perspective.

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Measurement in Sustainable Building

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Abstract: Measurement is a necessary aspect of planning and constructing buildings. However, recent attempts to integrate the social dimension of sustainable building into building design and specifications demand measurement of non-technical qualities, such as well-being. The Active House Alliance, in lieu of facing the disparity between the measurement of quantities and the experience of quality, seeks to bridge the gap with thorough evaluation programs and engagement with market and sociological research. Whereas well-being is not technically measurable, these evaluations lead to improvement of the metrics and continued provision of sustainable buildings to market demand.

I. Introduction

Measurement is key to the adoption of sustainability in corporate practice, spanning from identifying issues to reporting progress. It is important for legitimacy, communicating with other practitioners, and for identifying the direction in which to aim development. In the building industry, it is imperative that sustainability factors can be measured so that they can be integrated into building design, engineering, construction, evaluation; and ultimately so that they might be incorporated into legislation. Historically, the measurement of energy in buildings has been the main focus; which in and of itself has been redefined and refined since the 1960's. Yet the anticipated energy performance of buildings consistently underestimates how much energy is actually used in practice, known as the performance gap. This is usually attributed to the behavior of people using the buildings^[1]. Further, as the understandings of holism around sustainability in building expand, factors that affect behaviour come under scrutiny as to their measurability. In moving beyond the measurement of electricity usage -- which can be directly recorded through metering, builders are confronted with qualitatively embedded, inherently social phenomenon that are difficult to not only record, but to even define.

II. Active house

The Active House Alliance, a multi-stakeholder sustainable building alliance, represents an interesting case of sustainability measurement, as they seeks to incorporate human well-being into building specifications. The ideology is that a high level of well-being, underpinned by comfort and health, drives sustainable behaviour in buildings. One of the alliance's founding members, VELUX, a roof-top windows manufacturer headquartered in Denmark, has spearheaded a number of demonstration building projects around Europe

and North America (21 buildings in 12 countries) in order to both demonstrate that wellness can be specified for measurement and to improve these measurements. These demonstrations are primarily a tool for influencing policy (Interview 8 September 2014), but can also be described as a way of bridging theoretically-based simulations and real measurements. Peter Holzer, a Vienna-based building researcher quips, "Simulation: It's this thing nobody trusts, with the exception of the simulating engineer. Measurements: It's the thing everybody trusts, with the exception of the measuring engineer"^[2].

The alliance has developed a set of building specifications detailing the Active House standard's demanded measurement ranges. These include: daylight factor (DF), direct sunlight availability, maximum and minimum operative temperatures, standard fresh air supply (by CO₂ concentration), annual energy demand, percentage of energy supply from near or far sources, annual primary energy performance, life cycle factors (such as acidification and ozone depletion potential), improvement of freshwater consumption, recyclable content of the building, and percentage of responsibly sourced wood (Table 1). As comprehensive a set of specifications as this is, it begs two confounding questions: Are these measurements sufficient to describe the construction of a sustainable building? And even if so, is this a model of specification that is marketable on a large scale?

III. Measuring active house demonstrations

In order to address the first question, it has been necessary to evaluate the demonstrations for how well their performance matches the specifications to which they were built. To do this, VELUX studied five Active Houses that were also part of their earlier Model Home 2020 program, a major inspiration for the Active House Alliance. Five families in these Active House demonstrations partook in post-occupancy monitoring and lived "in the house for a full year to help measure, monitor and assess what they think about each"^[3]. The result of the social side of the evaluation was that "the families show high satisfaction with the indoor environment, that their expectations often are fulfilled, that house automation is acceptable, and being able to follow energy consumption and production increase awareness of their behavioural influence"^[3]. On the other hand, this does not reflect the technical performance of the building during habitation -- and for this, the evaluation is supplemented with technical measurements. These are compiled into radars,

which compare the expected building performance and the actual outcome (Figure 1).

FIGURE 1: ACTIVE HOUSE RADAR FOR SUNLIGHT HOUSE CALCULATED ACCORDING TO THE ACTIVE HOUSE SPECIFICATIONS. DISPLAYED WITH PERMISSION FROM THE ACTIVE HOUSE ALLIANCE.

Considering these evaluations, it is clear that something is



missing from the measurements. Some of the factors linked with wellness in buildings include: temperature, air quality, light, size and layout of space, sound, and view. For example, the evaluation of the LichtAktiv Haus demonstration in Hamburg, Germany showed that the family’s satisfaction was primarily related to daylight, fresh air, and space [2]. Other interviewees indicated the significance of indoor details such as interior design (Interview 28 May 2014) and historical quality (Interviews 8 September 2014 and 23 November 2014). Indeed, the specifications cover temperature, air quality, and light; but air quality is the only one of these typically regulated; and no standard accounts for the size or layout of space. Nor would it be considered possible or even desirable to specify furniture design or historical features (for an overview, see Table 1). This is not to say that they cannot be designed into a building, and in fact they are key components. Building professionals and integrated design make this possible. It is instead to argue that not all of these are practical to measure; and sustainable building thus faces the challenge of communicating and standardizing features that represent a sustainable building.

Active House’s efforts to set these standards do not occur in a vacuum, which touches on the second question regarding marketability and scale. Rather, the European Commission, the International Standards Organization (ISO), the European Committee for Standardization (CEN) seek to develop and refine sustainable building standards for Europe -- while

both raising the bottom line and establishing fluidity with building markets around the world. However, it is arguably the voluntary standards that have the freedom to advance the holism underlying sustainable building, as these do not run into trade restrictions (consider for example, the trade implications of mandating that only sustainability certified wood products can be used). Other sustainable building standards range vastly in their approaches. For example, Leadership in Energy & Environmental Design (LEED) from North America offers an expansive point-based system for certification -- so that focus can fall anywhere from building materials to neighborhood embeddedness; whereas Passivhaus from Germany, focuses on building energy demand. Active House seeks to balance energy, environment, and comfort within a simple message. And as it is not privatized, nor a certification, Active House can be used as a guide without conflicting with other certification systems.

TABLE 1: BUILDING DESIGN FACTORS AND THEIR RELATION TO THE ACTIVE HOUSE SPECIFICATIONS, EU REGULATIONS, AND WELLNESS.

Factor	Specified	Regulated (EU)	Wellness-linked
Daylight factor	Y	N	Y
Direct sunlight availability	Y	N	Y
Min temperature	Y	N	Y
Max temperature	Y	N	Y
CO2 concentration	Y	N	Y
Annual energy demand	Y	Y	N
Energy source	Y	N	N
Annual primary energy	Y	Y	N
Life cycle analysis	Y	N	N
Freshwater consumption	Y	N	N
Recyclable content	Y	N	N
Wood sourcing	Y	N	N
Space	N	N	Y
Sound	N	Y/N	Y
View	N	N	Y
Interior design	N	N	Y
Historical quality	N	N	N

However, to scale sustainable building, these standards must adapt the products towards what the market demands, towards what society is willing to pay for. Two contexts in particular drive Active House to engage sociological researchers to better understand upon which priorities sustainable building demand is based. Firstly, behaviour in the home has hardly been studied -- ostensibly because the home has historically been a place of sanctity. As culture shifts, and homes (and indeed our entire lives) open up through social media and blurred boundaries between workspace and private space, people are more accepting of sharing their home experiences. Secondly, sustainable building taps into latent demand -- demand which has gone unsatisfied due to unavailability -- but also unconscious demand. In other words, people have not necessarily brought to consciousness what is most important to them in a building and why, nor are they be aware of the impact

their building design choices will have upon their lives. As such, Active House has engaged a number of researcher teams, and has found a particularly research partner through Wegener et al.'s 2014 socio-psychological work. Early indications are that

(1) well-being is the most important factor for people in buildings, even over energy savings (Meeting 11 April 2014); and (2) that factors contributing to well-being in buildings can be measured ^[4].

IV. Conclusion

Altogether, there is a gap between measured factors and the holism needed for sustainable buildings. This gap is gleaned over if the suggested outcome is demonstrable, and the product is in demand. By engaging market and sociological research, and by orienting their specifications towards sustainable buildings that emphasize a high well-being potential, Active House can simultaneously improve upon the metrics for sustainable building and appeal to a market that forgives imperfect measurability so long as the product is in high demand.

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A New Vision of Value

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KPMG proposes that the new True Value (TV) methodology and the broader supporting report: A New Vision of Value (NVV) be presented at the upcoming International Sustainability Accounting Conference. Our approach to quantifying and monetizing social, environmental and economic impacts was launched last year and was informed by work with Oxford and a larger consortium of global academic thought leaders. In the interim we have continued to refine the methodology in collaboration with Harvard and Yale so we feel well positioned to speak to the effort to bridge corporate and academic approaches and contributions.

TV represents the world's first Social and Environmental P&L (SE P&L) methodology, an approach which allows for an overarching integrated assessment of a company's performance. This is a step which has far reaching implications for the intersection of sustainability and business strategy insofar as it identifies a company's critical drivers of social and environmental value creation and destruction.

We are entering an era in which companies can no longer afford to fly with half an instrument panel. The OECD, IMF as well as many top researchers are actively seeking ways to redefine corporate value. To these ends KPMG has teamed up with the WBCSD, the Natural Capital Coalition, the Moore Foundation and is performing research and writing case studies with Yale and Harvard to advance a methodology that combines measurement with management in ways that support sustainability, data driven decision making and strategic action.

KPMG's work represents a collaboration between academia and consulting aimed at rediscovering and redefining corporate value in ways that will have long term impacts on business and society for decades to come. We would be very pleased to share our findings with and receive input with our colleagues at the International Sustainability Accounting Conference..

I. Background

Historically, externalities have had little or no impact on the cash flows or risk profiles of most companies.

Findings from research for the publication of NVV as well as those from the application of the TV methodology demonstrate that most business leaders have an inaccurate understanding of their company's true value. In the past companies have not been fully rewarded for their positive externalities and have also not paid for much of the damage they cause through negative externalities such as carbon

emissions or the social effects of poor working conditions. Transformations in consumer sentiment, regulation and market dynamics are shifting the way value is recognized and ushering in a new era of internalization – externalities, both positive and negative will become part of the balance sheet. How companies navigate and manage this internalization will critically define competitive advantage moving forward – it may be central or complementary, but it cannot be avoided.

The TV approach was born from the awareness that as long as sustainability initiatives are selected on the basis of their ideological and normative merit they will remain marginal at best. Sustainability will not be realized at the core of company strategy and correspondingly mainstreamed unless CEOs and CFOs can compare side-by-side the value of projects that carry significant social and environmental impacts with the value of any other. The TV approach is based upon the finding that significant untapped value exists and will be recognized if and when it is accurately measured..

II. SE P&L Methodology in Action

Last year the world's first Social and Environmental P&L was produced and courageously made public by Ambuja Cement (a Holcim subsidiary and the largest cement manufacturer in India). This type of SE P&L is radically different than 'footprinting' initiatives such as the one carried out by Puma in 2010 because it utilizes a methodology which captures both positive and negative externalities of a company's social and environmental impact in financial terms and then provides strategic pathways to consider the impact of and prioritize a company's most critical value drivers. Once all externalities have been identified a clear picture of the true value of a company emerges, allowing the most salient issues of sustainability to be described in transparent financial and strategic terms.

This is a very important step forward towards the integration of strategic and sustainable business - one overarching approach that lends deep insight into the true value that a company creates – and a tool for objective investment decision making. It is likely that most companies will prefer to use the TV methodology as an internal strategy tool to assess risks to future earnings. In the case of Ambuja, it was discovered that internalization could lead to a substantial EBITDA margin increase. As more and more companies like Ambuja boldly choose to make their findings public for the world to see the competitive playing field will increasingly be one that favors transparency.

The idea of SE P&L is gaining momentum and multinational leaders are beginning to emerge in every sector: cement, automotive, PE, telecom, rail, pharma, global retail, etc. Some choose to use this type of approach internally to inform strategy, operations and investment decision making, and others communicate results externally to shareholders and stakeholders.

KPMG is works closely with a consortium of business schools and leading organizations in this area with the aim to support the evolution of the SE P&L as a tool to understand impact and drive performance. In the coming era of radical transparency, data will become more readily accessible and SE P&L approaches will become more standardized and easier to execute even by those (students, NGOs, competitors, etc.) with only publicly available data.

A New Vision of Value

The KPMG report A New Vision of Value explores more broadly how our conception of value is shifting. It provides a brief context for the role that externalities have historically played in the market and then examines three specific drivers of internalization. On hand from a series of case studies the report describes how a variety of industries can apply and benefit from the TV methodology to protect and create integrated forms of corporate and societal value. TV has already been successfully applied in private equity, retail, transport and manufacturing.

We all know that we can only manage what we measure and that the more frequently and accurately we are provided feedback, the more timely and effective our responses are. Imagine a world where companies quantify and monetize their externalities and build corporate value through the enhancement of social and environmental value – i.e. steering not with blinders but on a firm basis of true value.

International Sustainability Accounting Conference

In an effort to broaden and evolve the understanding of the TV approach and the work that is being done by others in this very important space KPMG is honored to present its findings and engage in spirited debate at the upcoming ISA Conference.

Environmental and Sustainability Management Accounting for Sustainable Aviation Fuels

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Abstract: This paper examines environmental and sustainability management accounting for aviation fuels made from renewable resources, such as biomass, otherwise known as 'sustainable aviation fuels'. Environmental and sustainability management accounting is essential to address concerns about the environmental, social and economic performance of sustainable aviation fuels. However, a gap currently exists between corporate and academic approaches. To shed light on this important issue, this paper defines 'sustainable' in the context of aviation fuel and investigates future action and research that is required to bridge the gap between corporate and academic approaches to improve the environmental, social and economic performance of sustainable aviation fuels.

I. Introduction

Airlines require aviation fuel to operate aircraft^[1]. Aviation fuel is made from either: a) non-renewable fossil fuels, such as kerosene and gas, which emit greenhouse gases into the atmosphere, including carbon dioxide (CO₂), when burnt in jet engines, otherwise known as 'non-sustainable aviation fuels' [2,3]; or b) a blend of renewable resources, such as biomass, otherwise known as 'sustainable aviation fuels', which emit up to 80% less CO₂ emissions than fossil fuels^[4]. Currently a gap exists between corporate and academic approaches regarding the measurement of sustainable aviation fuels environmental, social and economic performance [5, 6]. Academics offer numerous approaches^[7] and airlines and aviation fuel producers mainly rely on one tool, Lifecycle Analysis (LCA), which does not measure economic performance, is complex to use and inconsistently applied^[8].

Sustainability reporting for aviation fuels is an important issue because airlines have committed to carbon neutral growth by 2020^[9]. Sustainable aviation fuels are critical to achieving this target, as only minimum efficiency gains can be achieved through technology developments^[10] and over 95% of airlines' CO₂ emissions come directly from the combustion of aviation fuels^[11]. However, sustainable aviation fuels can not currently compete with non-sustainable fuels on economic performance^[12]. There are also concerns about the environmental and social performance of some sustainable aviation fuels^[5].

To further understand these important issues, this paper defines 'sustainable' in the context of aviation fuel and investigates options to bridge the gap between corporate and academic approaches that may assist sustainable aviation fuels compete with non-sustainable aviation fuels.

II. The problem of airlines current dependence on fossil fuels

Non-sustainable aviation fuels, made from fossil fuels, are the dominant fuel source for airlines^[1]. This is because sustainable aviation fuels cost twice the price^[12]. This is a problem for airlines as non-sustainable aviation fuels are a finite resource and emit greenhouse gases into the atmosphere, including CO₂, when combusted in jet engines^[13]. Sustainable aviation fuels offer the potential to diversify airlines' fuel supply and reduce life cycle fuel CO₂ emissions by 60% to 80%^[4]. This is because sustainable aviation fuels are made from renewable resources, such as biomass^[1]. Biomass used to produce sustainable aviation fuels is created by photosynthesis of CO₂ with water^[14]. In contrast, fossil fuels, used to make non-sustainable aviation fuels, are created from atmospheric CO₂ that has been sequestered in the ground for millions of years^[15]. When non-sustainable aviation fuels are combusted in jet engines, the CO₂ that had previously been sequestered is released to the atmosphere^[16]. When sustainable aviation fuels are combusted, the CO₂ emitted can be offset by biomass production (Figure 1)^[14]. However, not all sustainable aviation fuels offer quantifiable sustainability benefits, with some causing environmental degradation, including indirect land use change and unacceptable social impacts, such as competition for fresh water requirements and food production [1, 17].

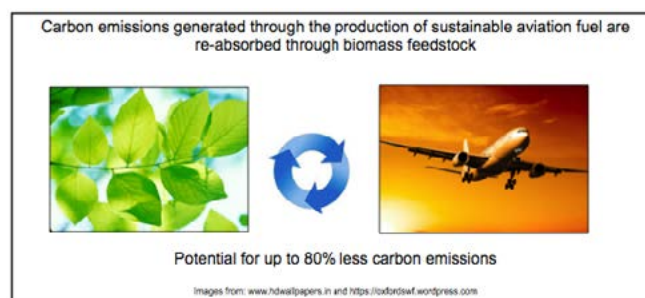


FIGURE 1: SUSTAINABLE AVIATION FUELS CO₂ SAVINGS

III. Defining 'sustainable' in the context of aviation fuel

The world's aviation regulatory body, the International Civil Aviation Organization (ICAO), address the above concerns about the environment and social performance of aviation fuels through a three-part definition of sustainability^[9]. According to ICAO, to be considered 'sustainable' aviation fuels must: a) offer net CO₂ reductions [to fossil fuels] over their lifecycle; b) not compete with fresh water requirements and food production; and c) not cause deforestation or other environmental impacts such as biodiversity loss^[9]. The ICAO definition thus overcomes the debate in the literature, and corporate practice, regarding the term 'sustainable' [6, 18].

To quantify the benefits of sustainable aviation fuels, in comparison to non-sustainable aviation fuels, the full life-cycle CO₂ emissions must be assessed^[19]. This life cycle assessment should include evaluation of CO₂ emissions resulting from: a) the environmental impact of feedstock; b) biorefinery processes; and c) distribution systems from the biorefinery to airports^[8].

Further, sustainability should include consideration of economic performance^[20]. Measurement of aviation fuel sustainability performance must therefore include relevant scales of environmental, social and economic performance^[20].

IV. Environmental and sustainability management accounting for sustainable aviation fuels

Numerous tools exist to measure aviation fuel sustainability performance^[7]. These include: a) analysis and evaluation tools (e.g., LCA^[8]); b) action tools (e.g., environmental management systems (EMS)^[21] and Sustainability Balanced Scorecard (SBSC)^[22]) and c) communication tools (e.g., sustainability reporting^[23] and^[7].

A LCA evaluates the potential impact of a product or process from its raw materials, production and use through either an attributional or consequential approach^[19]. The attributional approach accounts for the impact of the product itself^[19]. The consequential approach includes the impacts of the product, associated products and the production processes, including energy use, direct and indirect land-use change and food prices^[19]. International Organization for Standardization (ISO) 14044:2006 provides the overarching framework for LCA^[19]. However, this framework does not prescribe a standardised LCA method^[19].

EMS includes a set of processes and practices that enable an organisation to reduce its environmental impacts and increase its operational efficiency^[24]. These processes and practices include environmental policies and objectives, internal audits and environmental accounting, and protocols to improve environmental management^[24]. EMS standards are mandated by ISO 14001, and the Eco Management and Audit Scheme (EMAS) regulated by the European Regulation EC 1221/2009^[21].

SBSCs integrate environmental and social issues with the general management of a business unit^[22]. Unlike, EMS, SBSC is purely a measurement system^[25]. Thus SBSC provides a valuable support for successful decision-making^[26], reporting performance against environmental and social matrix, but does not provide guidance on appropriate action or strategies^[22].

In contrast, sustainability reporting supports organisations to communicate with their stakeholders on social and environmental performance^[27]. The Global Reporting Initiative (GRI) is currently the most used sustainability report guideline^[27]. However, the GRI does not mandate a consistent approach to audit and assurance, leading to concerns over the trustworthiness of some sustainability reporting^[27].

Other accounting tools to be further explored in the context of sustainable aviation fuels include, but are not limited to, full cost accounting, natural capital accounting, input-output analysis, triple-bottom-line and carbon footprints^[5].

V. The gap between academic approaches and corporate practice

Currently a gap exists between academic approaches and corporate practice regarding the measurement of aviation fuel sustainability performance^[5]. LCA is the current tool used by aviation fuel producers^[8]. Using the consequential LCA approach the sustainability benefits of aviation fuels are variable, and not always as good as claimed^[28]. This can be due to factors such as: a) the use of fertilisers; b) energy and water use; and c) emissions from industrial conversion processes [5, 29]. In the absence of a standardised LCA method it is also difficult to compare outputs from different LCA studies [19, 30]. Further, LCA fails to assess economic performance^[8]. Academics provide a number of tools, such as full cost accounting, natural capital accounting, input-output analysis that can address the limitations of LCA^[7]. The Foundation Center also lists over 150 tools available for social accounting and social impact^[31]. These tools have been observed to operationalise sustainability strategies very effectively^[7]. However, these tools have not been widely applied by aviation fuel producers^[5].

This presents an issue for organisations, such as World Business Council for Sustainable Development members BP and DuPont, who use LCA to certify the sustainability credentials of sustainable fuel^[32]. BP and DuPont have developed sustainable fuel through the establishment of through a Joint Venture, Butamax™ Advanced Biofuels (Butamax), in 2009^[32]. Since its inception, Butamax has developed an innovative sustainable fuel, known as biobutanol^[32]. Biobutanol converts sugars from various biomass feedstocks, including corn and sugarcane^[32]. Butamax used LCA to guide the development of production pathways for biobutanol that were superior to traditional biological production processes^[33] and is recognised as one of the '50 Hottest Companies in Bioenergy'^[34]. Further, in 2013,

Butamax was awarded Biofuel Digest Fuel of the Year^[34]. However, the sustainable fuel developed by Butamax is currently not available at a price that can compete with non-sustainable aviation fuel^[12]. Further, the absence of standardised LCA methods create uncertainty for airlines in assessing and comparing the sustainability of sustainable fuel options, such as those offered by Butamax^[9]. To address this issue and advance the sustainable aviation fuel industry further work is required to bridge the gap between corporate and academic approaches regarding the measurement of aviation fuel sustainability performance^[5].

VI. Conclusion

Over recent years, accounting research and practice have shifted in line with the complexity of sustainable development problems^[5]. Many tools exist to measure aviation fuel sustainability performance^[7]. However, these tools are not being applied in practice^[5]. To bridge the gap between academic and cooperate approaches further exploration of three key issues is required^[5]. Firstly, sustainable fuel certification standards and schemes must be established and agreed internationally^[5]. Secondly, the boundaries of the sustainable fuel production process to be captured by accounting measurement tools must be defined^[5]. Lastly, the fit between existing sustainability measurement tools, certification standards and schemes, and industry needs, structures and culture should be explored to identify the suitability of existing tools^[7]. It is essential that these issues be addressed to legitimatise the sustainable aviation fuel industry, provide assurance over sustainability performance, assist sustainable fuel to compete with non-sustainable fuel and enable airlines to buy sustainable fuels with confidence^[35].

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Qualitative minimum requirements as a first step in measuring sustainability

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Abstract: The theoretical basis of sustainability and the characteristics behind products necessitate multi-phase, qualitative methodologies to legitimately measure sustainability. Sustainability minimum requirements are a first step in this process. Based on a basic needs approach qualitative sustainability indicators can be formulated. This approach forms a valuable starting point for a pragmatic and practical methodology for the categorization of sustainable products.

I. The theoretical basis matters

The modern concept of sustainability derives from the report 'Our Common Future' by the United Nations World Commission on Environment and Development which was published in 1987^[1]. The central idea of sustainability is a holistic, multidimensional concept of an intra- and intergenerational justice which can be specifically understood in temporal terms as a preventive long-term orientation. The report acknowledges that the world does not face only an ecological, economical or development crisis. In fact, all those are symptoms of one interrelated crisis^[2]. To address this crisis the concept of sustainability had to become a guiding principle and its general claim is still: "Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life."^[3] What the concept of sustainability claims is strongly connected to what is already claimed by the Universal Declaration of Human Rights by the United Nations of 1948^[4]. The declaration points out that all humans have a right to have their basic needs fulfilled. Sustainability shares this objective with human rights but goes a step further: Sustainability recognizes that for the satisfaction of humans' basic needs it is crucial to create a new type of economical, ecological and social approach which shall enable a life worth living for current and future generations.

When we talk about methodologies or indicators to measure sustainability this theoretical basis is eminent because there is a recurring theme starting at the human rights and the report 'Our Common Future' to the present. Therefore, a determination of the theoretical basis of the concept of sustainability is inevitable when we want to measure sustainability and hence identify categories or indicators for a scientific analysis. Ignoring or simply not knowing of this theoretical basis will lead to a misunderstanding of the concept and thus to false conclusions.

II. Sustainability indicators

We want to measure sustainability. We want to quantify and objectify sustainability but: "[...] sustainability is an essentially vague concept, and it would be wrong to think of it as being precise, or even capable of being made precise."^[5] Quantitative methodologies which compare the performance of several products are not able of identifying the most sustainable alternative alone. They are capable of comparing the carbon emissions, the water consumption or a partial environmental impact for the products but this is not equivalent to measuring sustainability. There are two reasons for that. First: quantitative methodologies lack compelling indicators because of insufficient data. Second: sustainability is an unlike category as for example sales volume. One can estimate the sales volume of every product but it is not legitimate to measure the sustainability performance for each and every product in the same way. Calculating a relative numerical value for a product – in whatever way – does not correspond to the idea of sustainable development and should not be aimed to achieve. Life Cycle Assessments, Product Carbon Footprints, Eco-Efficiency Analyses and comparable methodologies are capable of providing an approach to compare certain products with each other, however, it would not be valid to say that the results of such a study show which of the compared alternatives would be the most sustainable. Thus, quantitative methodologies could be a part of a product sustainability measurement but they cannot measure sustainability on a product level by itself.

The United Nations published a first set of indicators to measure sustainable development in 1996 and renewed it in 2001 and most recently in 2007^[6]. The focus of this set of indicators is clearly on the national level and reflects the multidimensionality of sustainable development covering 16 themes with 50 core indicators. On a national level this is feasible because the required data should be available and it reflects the concept of sustainability as it emerges directly from the theoretical basis of sustainable development. Unfortunately, the same set of indicators is inoperable on a product level. Some of the core indicators may be adjusted so that product specific data could be used but for the majority of these indicators this is not possible due to insufficient data and the reason of an unlike category as stated above.

III. Minimum requirements as a part of the process

To address this problem we (BASF SE) developed a methodology to evaluate the sustainability performance of products. The so called Sustainable Solution Steering is a qualitative cradle to grave assessment methodology which compares product alternatives for a specific application with each other^[7]. This pragmatic approach allows to classify every considered product in one of four categories according to its contribution to sustainability. Inspired by the ideas of life cycle thinking, which means to include the whole value chain of products, this methodology evaluates products in their specific application.

I will examine the need of minimum requirements for the definition of sustainable products. If we accept the concept of human rights and the basic ideas of sustainability in the 'Our Common Future' report then the sustainability performance of a product is dependent of its specific application. A valid methodology for the measurement of the product specific sustainability performance must include qualitative requirements which are connected to these basic ideas. Only if a product fulfils these requirements a further assessment should be performed. Otherwise it is not legitimate to speak of it as a measurement of its sustainability performance. These requirements are closely linked to the basic needs of human beings. From the sustainability point of view preferable products are those which do not violate these basic needs in the first instance and furthermore also benefit those needs. This creates a spectrum with a range from a no-go area over a broad neutral zone up to a positive impact category. The minimum requirements act as a 'license to operate' in terms of sustainability.

As outlined above those requirements are linked to the concept of human rights and the concept of sustainable development. In my presentation I will show that the main maxim of the minimum requirements is to make sure that a product, its manufacturing, its application and its disposal or recycling does not harm the basic needs of human beings. These basic needs entail for example health and bodily integrity, freedom of thought, speech, religion and body, freedom of movement, right to water, food, shelter and clothing, right to an intact ecosystem, right to a social life, right to work and to free time. The core idea is that a product in its life cycle is not allowed to interfere with the well-being and the basic needs of human beings.

Minimum requirements for products and their producers that emerge from this claim are for example:

- Secure manufacturing processes for the workforce and the environment
- No carcinogenic, mutagenic or reprotoxic substances in an end-product in a sensitive application
- No persistent, bioaccumulative and toxic substances in an end-product or in manufacturing under the risk of environmental exposure
- No child labour which impairs the well-being and the development of children^[8]
- No applications which violate the well-being of humans like drugs, weaponry (including technology know-how, pre-products and biological or chemical weapons), malicious software etc.
- No untruthful marketing, unfair competition, fraud or exploitation of labour

IV. Conclusion

Defining minimum requirements can only be a first step in a multi-phase assessment which needs to acknowledge that the theoretical basis of sustainability sets the general framework for measuring sustainability. An exclusive quantitative methodology can never reflect the essential ideas of the general framework. Thus, a qualitative analysis part in the process of measuring sustainability on product level is inevitable.

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A Study of Material Flow Cost Accounting (MFCA) Diffusion: The Case of MFCA as a Production Improvement Tool

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Abstract: This study examines the ‘soft’ issues of Material Flow Cost Accounting (MFCA) through a case study in which MFCA is positioned as a production improvement (PI) tool; thus, this study contributes to the knowledge on MFCA diffusion. The study focuses on how to resolve the problems of the ‘economic rationale’ and ‘culture’ (the origins of the adopters’ resistance, [1]), and how to improve the ‘relative advantage’ and ‘compatibility’ (the ‘perceived attributes of innovation’, [2]), while implementing MFCA. The main findings of this study are that: (1) changing the positioning of MFCA is one approach for resolving the ‘culture’ problem and improving the ‘compatibility’ of MFCA, and (2) identifying the differences and advantages of MFCA, when compared with other tools, is important to address the ‘economic rationale’ problem, and to improve the ‘relative advantage’.

I. Introduction

Material Flow Cost Accounting (MFCA) is an environmental management accounting (EMA) tool that is authorised as ISO14051, and defined as a ‘tool for quantifying the flows and stocks of materials in processes or production lines in both physical and monetary units’ [3, p. 3]. Many companies have implemented MFCA worldwide for various reasons. In Japan, for example, the number of companies that have experience implementing MFCA is said to be over 300 [4]. Moreover, knowledge about MFCA has been accumulated by various studies on the subject. At the 16th Environmental and Sustainability Accounting Network Conference on MFCA (held in Dresden, 2013), 25 research papers on MFCA were presented; 12 were theoretical studies, and 13 were case-based studies [5].

MFCA can assist organisations in better understanding the potential environmental and financial consequences of their material and energy use practices [3]. Further, it can help organisations seek opportunities to achieve both environmental and financial improvements, via changes to those practices [3]. Thereby, for governments that seek to build a sustainable world, encouraging companies to implement MFCA is important because it leads to a reduced environmental load in those countries. Therefore, the method for MFCA diffusion becomes an important focus for governments.

Take the case of Japan, for example, where MFCA has been diffused to some extent in association with the government’s subsidiary. Here, academic researchers introduced MFCA as an EMA tool to the academics and the Ministry of Economy, Trade and Industry (METI); subsequently, many companies implemented MFCA. Quite a few of the companies that have implemented MFCA are subsidised by the METI or local governments. Therefore, there have been many case studies done on MFCA, as the METI or local governments asked the companies to disclose the effects of MFCA. So far, the usefulness of MFCA has been confirmed through many case studies by academic researchers and practitioners. Additionally, in recent years, studies trying to integrate MFCA with other management tools, such as the Life Cycle Impact Assessment Method based on Endpoint Modelling (LIME), Carbon Footprint of Products (CFP), and Theory of Constraints (TOC) have emerged [6],[9]. MFCA was developed in cooperation with academics, practitioners, and the governments, at least in Japan. There are many case studies and theoretical studies on MFCA. As such, academic researchers, practitioners, and the governments have contributed to the knowledge on MFCA. However, the knowledge on the diffusion of MFCA is rather limited. This could be because most prior studies focused on the ‘hard’ issues of MFCA rather than on the ‘soft’ ones. Although Christ and Burritt [10] addressed the ‘soft’ issues of MFCA, focusing on the influence of ISO involvement, the amount of research is limited. When we consider the diffusion of MFCA, we should examine not only the ‘hard’ issues, but also the ‘soft’ ones, such as the problems faced by the adopters. Although there is extensive research on MFCA, little is known about its diffusion. Thus, this study focuses on the ‘soft’ issues of MFCA in order to accumulate knowledge on its diffusion.

This study addresses the ‘soft’ issues through a case study that involves a discussion of MFCA’s positioning in Japan. This discussion was performed through the Working Group (WG) of the MFCA Forum Japan,1 which ran for two years starting in 2011. The main purpose of the WG is to diffuse MFCA as a production improvement (PI) tool that helps organisations improve their productivity. The WG members are mainly MFCA consultants, who are aware that the adopters’ limited knowledge about accounting leads to challenges in implementing MFCA. Therefore, they have tried to position MFCA as a PI tool; the WG positions MFCA along with industrial engineering (IE) and total productive management and maintenance (TPM), which are the PI tools widely used in Japan.

The purpose of this study is to consider the 'soft' issues of MFCA through a case study in which MFCA is positioned as a PI tool; thus, this study contributes to the knowledge on MFCA diffusion. The rest of this paper is organised into four sections. Section 2 presents the various perspectives related to the problem of diffusion. Section 3 presents the case where MFCA was positioned as a PI tool. Section 4 discusses the case introduced in the third section, from the perspective of diffusion. The final section of the paper summarizes the findings, as well as presents suggestions for policymakers and directions for future research.

II. Perspectives related to diffusion

2.1 Perceived attributes of innovations

This section presents the research perspectives. As was described in the previous section, this study focuses on the 'soft' issues of MFCA. When we consider the 'soft' issues, Diffusion of Innovation ^[2] provides a starting point. The book ^[2] focused on the adopters of innovation and defines innovation as 'an idea, practice, or object that is perceived as new by an individual or other unit of adoption' [p. 12]. MFCA can be regarded as an innovation for all of the companies that initially try to implement it.

This study employs Rogers' ^[2] concept of the 'perceived attributes of innovation', which are the characteristics of innovation as perceived by the adopters, and they constitute one of the variables determining the rate of adoption ^[2]. Further, Rogers ^[2] identified five attributes of innovation: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability.

First, 'relative advantage' is 'the degree to which an innovation is perceived as being better than the idea it supersedes. The degree of relative advantage is often expressed as economic profitability, as conveying social prestige, or in other ways. The nature of the innovation determines what specific type of relative advantage (economic, social, and the like) is important to adopters, although the characteristics of potential adopters may also affect which specific subdimensions of relative advantage are most important' [2, p. 229]. Secondly, 'compatibility' is 'the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter and fits more closely with the individual's situation. Such compatibility helps the individual give meaning to the new idea so that it is regarded as more familiar. An innovation can be compatible or incompatible with (1) sociocultural values and beliefs, (2) previously introduced ideas, and/or (3) client needs for the innovation' [2, p. 240]. Thirdly, 'complexity' is 'the degree to which an innovation is perceived as relatively difficult to understand and use' [2, p. 257]. Fourthly, 'trialability' is 'the degree to which an innovation may be experimented with

on a limited basis' [2, p. 258]. Finally, 'observability' is 'the degree to which the results of innovation are visible to others' [2, p. 258].

The greater the perceived 'relative advantage', 'compatibility', 'trialability', and 'observability' of innovation, the more rapid its rate of adoption. Further, the 'complexity' of an innovation—as perceived by the members of a social system—is negatively related to its rate of adoption. The 'perceived attributes of innovation' is a concept that focuses on the adopters' perception. Rogers ^[2] identified the characteristics of innovation from this perspective.

This concept can be employed in the management accounting area. For instance, through a case study of General Motors, Anderson (1995) extracted the complexity of use, compatibility with existing accounting systems, and relative improvement over the existing cost system as important technical factors that affect the implementation of activity-based costing (ABC) ^[11]. When we consider the diffusion of MFCA, we can also use the concept of the 'perceived attributes of innovation' as an evaluation tool.

2.2 Resistance of adopters

It is important to consider the resistance of the adopters when we address the 'soft' issues of MFCA. The problem of adopters' resistance has been discussed in management accounting studies mainly after Shields and Young ^[12] argued that 'perhaps the biggest challenge in successfully implementing a cost management system is individual and organizational resistance to change' [p.22]. The adopters' resistance variable has been regarded as an important obstructive factor in implementing this management accounting tool (e.g. ^{[13],[15]}).

Some prior studies focused on the problem of resistance. A notable example is Malmi ^[1], who considered adopters' resistance through the case of a large decentralised company that tried to implement the ABC system. The adopter of ABC was the factory which produces the strategic components for the company. Through this case, Malmi ^[1] identified the three origins of adopters' resistance: (1) economic rationale, (2) politics, and (3) culture.

Starting with the 'economic rationale' as the origin of resistance has been mainly discussed as follows. First, in this factory, the ABC system essentially provided the same information as did the existing system. Therefore, one could assume that there was little incentive to maintain the ABC system. Second, the ABC system created additional budgeting work for the factory, as the number of activities (56) exceeded the number of responsibility centres (10) currently in the budget. Therefore, the ABC system was perceived to induce costs in terms of extra work.

Next, 'politics' as the origin of resistance has been mainly discussed as follows. The output of the factory was the strategic components. The factory supplied the output to

other units. All of the products made by the other units were equipped with the components made by the factory. Therefore, the other units' sales depended on the factory's ability to supply the required components. In addition, the ability to provide the critical resources required by the other parts of the organisation leads to a situation of power. Thus, the transfer price of the components was determined in such a way as to make the factory look profitable. If the ABC system were implemented, it would reveal the 'true' cost of the components, which would have increased the bargaining power of the other subunits in transfer pricing and resource allocation negotiations, implying a shift of power from the factory to buying units.

Finally, 'culture' as the origin of resistance has been mainly discussed as follows. In this factory, accounting was not believed to be of primary importance. Dialogue at the factory was accomplished in terms of production quotas, quality issues, throughput times, new products, and the optimisation of production schedules. It is difficult to implement systems that are not previously emphasised in the culture.

Because the resistance of the adopters is an important obstructive factor, we should identify the origin of the resistance and, subsequently, resolve the problem. Thus, when we consider the diffusion of MFCA, we should address these issues.

2.3 Research perspective

This study examines the relationship between the resistance of the adopters and 'perceived attributes of innovation'. Markus and Preffer^[16] presented a good example of the significance of this relationship when they argued that the degree of fit, or match between the new accounting system and organisation's culture and system of shared values and beliefs, could explain the ease and success of implementation. Their argument implies that culture could be the origin of the adopters' resistance^[1], and that resolving this problem would involve increasing 'compatibility', which is one of the 'perceived attributes of innovation'^[2]. This argument seems to be applicable to another situation: when the 'economic rationale' is identified as the origin of resistance, resolving the problem would mean increasing the 'relative advantage', which is one of the 'perceived attributes of innovation'.

This study focuses on the 'economic rationale' and 'culture' as the origins of adopters' resistance^[1], and the 'relative advantage' and 'compatibility' as the 'perceived attributes of innovation'^[2]. Identifying the origin of the resistance and resolving that problem would involve increasing the rate of adoption because the corresponding 'perceived attributes of innovation' would improve. Specifically, recognising and resolving the problem of the 'economic rationale' would imply increasing the rate of adoption because the 'relative advantage' would improve. Recognising and resolving the

problem of 'culture' would require increasing the rate of adoption because the 'compatibility' would improve. This research perspective is important to resolve the problem of the 'economic rationale' and 'culture', in order to encourage MFCA diffusion.

Therefore, this study focuses on how to resolve the problem of the 'economic rationale' and 'culture' (which are the origins of adopters' resistance), and how to improve the 'relative advantage' and 'compatibility' (which are the 'perceived attributes of innovation'), while implementing MFCA. This issue will be discussed in Section 4. The following section describes the case study that forms the basis of this research.

III. Positioning mfca as a pi tool in japan

As was described in the preceding section, this research focuses on the adopters of the innovation. The research problem deals with how to resolve the problem of the 'economic rationale' and 'culture' (origins of adopters' resistance), and how to improve the 'relative advantage' and 'compatibility' ('perceived attributes of innovation'), while implementing MFCA. The discussions held by the WG of the MFCA Forum Japan related to positioning MFCA as a PI tool provide sufficient research material.

Therefore, the WG discussion has been selected as the focus of analysis in this research.

The WG began discussions on June 8, 2011, and was suspended on June 5, 2013. The WG meetings were held 18 times over two years.² Most of the members of the WG were consultants in the business of implementing MFCA; the others were practitioners with experience in implementing MFCA or those trying to implement it, certified public accountants interested in it, and academic researchers who had studied it.

The main purpose of the WG was to diffuse MFCA as a PI tool. The moderator of the WG was aware of the problem that 'most people do not recognize MFCA as the useful PI tool'^[17], which is why the WG was organised. The WG members had a similar awareness of the problem, though in varying degrees. Some of the consultants (among the WG members) argued about the importance of positioning MFCA as a PI tool: "The adopters' less knowledge on accounting causes the barrier of implementing MFCA".

MFCA is implemented at the manufacturing lines. Therefore, the employees responsible for the manufacturing lines are often regarded as the adopters. Because the adopters are more familiar with PI tools than accounting tools, the WG members thought that positioning MFCA as a PI tool would be meaningful. Moreover, the selection of PI tools is also important. In the WG, IE and TPM were selected as the PI tools to be discussed because they are widely used in Japan.

In the WG, the name ‘Material Flow Cost Accounting’ was found to be problematic. Some members argued that the employees in the production line would be averse to the term ‘accounting’. Therefore, the WG tried not to use the term; subsequently, the term ‘MOTTAINAI Engineering’ (ME)³ was developed. The word ‘MOTTAINAI’ is related to ‘resource productivity’, which is the core concept of MFCA.⁴

Although IE and TPM also target materials, they do not focus on materials. Therefore, for instance, they cannot target materials when the materials move between the manufacturing lines. Thus, ME was positioned as a PI tool, juxtaposed with IE and TPM, and MFCA was positioned as a measurement tool that is a constituent of ME. In the WG, IE was positioned as a PI tool that focuses on the ‘Man’ and helps organisations improve ‘Man’s productivity’. TPM was positioned as a PI tool that focuses on the ‘Machine’ and helps organisations improve ‘Machine productivity’. ME was positioned as a PI tool that focuses on the ‘Material’ and helps organisations improve the ‘Material’s productivity’. Thus, MFCA is positioned as a constituent element of ME, which is a PI tool juxtaposed with IE and TPM. Figure 1 presents the relationships among IE, TPM, and ME.

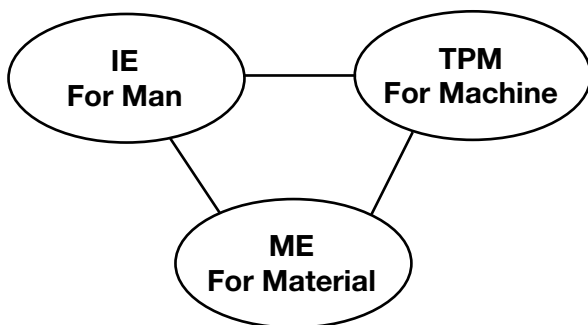


FIGURE 1. RELATIONSHIPS AMONG INDUSTRIAL ENGINEERING (IE), TOTAL PRODUCTIVE MANAGEMENT AND MAINTENANCE (TPM), AND MOTTAINAI ENGINEERING (ME)

In addition to the discussions on positioning MFCA as a PI tool, the WG members discussed the effects of improving productivity. IE is a PI tool that aims to improve ‘Man’s productivity’, and TPM is a PI tool that aims to improve ‘Machine productivity’. Although IE and TPM seem to be completely different tools, they have one key thing in common: they aim to improve ‘time productivity’. IE helps companies improve the ratio of the amount of products (output) to the job time of workers (input), and TPM helps companies improve the ratio of the amount of products (output) to the job time of machines (input). In this sense, ME is different from IE and TPM. ME does not aim to improve ‘time productivity’; rather, it aims to improve ‘resource productivity’.

Improving ‘time productivity’ and ‘resource productivity’ are entirely different in terms of their effects. The former involves improving the capacity of production. This would lead to significant benefits for the companies only if the demand exceeds the supply because the benefits are gained after the products are sold, although it is possible for them to reduce the number of workers or machines. Moreover, the effects of the latter can be seen in many situations. If companies succeed in improving ‘resource productivity’, the amount of materials that they have to buy would be reduced. Because the effects of improving ‘resource productivity’ can be seen earlier, when compared to those of improving ‘time productivity’, they can be seen in most situations. The WG members highlighted this advantage of ME.

IV. Discussion

This study focuses on how to resolve the problem of the ‘economic rationale’ and ‘culture’ (the origins of adopters’ resistance), and how to improve the ‘relative advantage’ and ‘compatibility’ (the ‘perceived attributes of innovation’), while implementing MFCA. This issue is discussed further in this section. First, the problem of ‘culture’ and ‘compatibility’ is discussed; subsequently, the problem of ‘economic rationale’ and ‘relative advantage’ is addressed.

4.1 How to address the ‘culture’ problem and improve ‘compatibility’

It is important to consider the interests of the employees who work in the manufacturing lines because MFCA is implemented at this level. These employees are the adopters of MFCA; most are more familiar with production improvement than with accounting or environmental management. The WG members recognised this problem and positioned MFCA as a PI tool.

The WG addressed the ‘culture’ problem related to the resistance of the adopters in the following manner. When the employees in the manufacturing lines work in a culture of production improvement, without sufficient knowledge of accounting, there is a gap between MFCA and the adopters. In this situation, it is necessary to match MFCA and the culture, for which there are two approaches: (1) match the culture to MFCA, or (2) match MFCA to the culture. The WG selected the latter approach. Although the former approach seems sufficient, changing the culture would be difficult.

When we match MFCA to the culture in the manufacturing area, the ‘compatibility’ of MFCA naturally improves. Positioning MFCA as a PI tool (with which the adopters are familiar) makes it easier for the adopters to understand MFCA. Thus, the WG addressed the ‘culture’ problem by changing the positioning of MFCA, thereby improving its ‘compatibility’.

4.2 How to address the 'economic rationale' problem and improve 'relative advantage'

The WG also addressed the 'economic rationale' problem. While considering this problem, we should focus on the extent of the differences with the existing tools and additional work required^[1]. If MFCA does not have any significant difference from the existing PI tools, and if it creates a large amount of additional work for the adopters, it would be difficult to implement.

The WG members discussed the differences of ME from IE and TPM. ME can help organisations to improve the 'Material's productivity'. Although IE and TPM also target materials, they do not focus on materials. Therefore, they are not adequate for managing materials. In addition, the effects of implementing MFCA can be seen in many situations because the effect of improving 'resource productivity' becomes apparent when the companies buy the materials. As aforementioned, the benefits of improving 'resource productivity' can be seen earlier than those of improving 'time productivity'; thus, the discussion of the differences of MFCA from the other tools seems to contribute to resolving the 'economic rationale' problem, and the discussion of the advantages of MFCA is equivalent to a discussion on improving 'relative advantage'.

In terms of the 'economic rationale' problem, it is important to reduce the additional work as much as possible. In order to address this problem, the WG juxtaposed ME with IE and TPM. ME was positioned as a PI tool to manage the 'Materials', not to manage the 'Man' or the 'Machine'. The companies implementing IE and TPM have to implement only the aspect related to materials when they implement MFCA. Thus, the adopters have to add only the aspect pertaining to materials to their existing systems.

V. Conclusion

This study focused on how to resolve the problem of the 'economic rationale' and 'culture' (the origins of adopters' resistance), and how to improve the 'relative advantage' and 'compatibility' (the 'perceived attributes of innovation'), while implementing MFCA. The WG discussion on positioning MFCA as a PI tool revealed some ways to resolve the adopters' resistance and improve the 'perceived attributes of innovation' while implementing MFCA.

The WG positioned MFCA as a PI tool because the adopters are familiar with these tools. When the adopters work in a culture of production improvement, without sufficient knowledge of accounting, there would be a gap between MFCA and the adopters. Changing the positioning of MFCA is one of the approaches for addressing this problem; it is also one of the approaches for improving the 'compatibility' of MFCA.

In addition to the positioning of MFCA, the WG members discussed the differences between MFCA and the other tools, as well as the advantages of MFCA compared to those other tools. If MFCA does not lead to economic benefits for a company, it would not have an 'economic rationale'. Therefore, the discussion on the differences between MFCA and the other tools is important. Because MFCA focuses on materials (which are not considered in detail by the other tools), MFCA has an advantage in terms of the 'economic rationale'. This advantage is that the benefits of the effects of implementing MFCA are visible early; therefore, the benefits can be seen in most situations. Thus, identifying the relative advantages of MFCA is important in terms of diffusion.

This study aimed to examine the 'soft' issues of MFCA through a case in which MFCA was positioned as a PI tool, and to contribute to the knowledge on the diffusion of MFCA. Governments seem to play an important role in the diffusion of MFCA; therefore, I present a suggestion for policymakers. This research finds that changing the positioning of MFCA is one of the approaches for resolving the 'culture' problem and improving the 'compatibility' of MFCA. The approach that tries to match MFCA to the adopters seems to be applicable in different situations. Moreover, governments that try to promote MFCA should first identify the adopters' interests. Subsequently, they should try to position MFCA in a larger context, and relate it to those interests. This suggestion would appear difficult to implement. However, it would be made easier if various researchers, practitioners, consultants, and governments would participate in the project together. The WG of the MFCA Forum Japan is a notable example where such a project was accomplished.

Identifying the differences between MFCA and the other tools, as well as the advantages of MFCA compared to the other tools, is important to address the problem of 'economic rationale' and to improve the 'relative advantage'. This finding provides direction for future research. Studies addressing these differences and advantages would contribute to MFCA diffusion. Further, the adopters have various interests and use various tools. Thus, matching MFCA to them is one way of diffusing it. This study has two important limitations. First, the research evaluates only the discussion of MFCA as a PI tool from the perspective of diffusion. The author did not study the practices where MFCA was actually implemented as a PI tool. This perspective should be studied in future research. Second, this study assumes that the adopters are only those employees who work in a culture of production improvement. Although the adopters assumed in this research represent a typical set of adopters, there are other types of adopters. Therefore, the interests of various types of adopters should be examined in future research.

The problem of 'politics' as the origin of adopters' resistance implies that the accounting tool is destined to be resisted. However, we can address the problem of adopters' resistance by identifying the adopters' interests and matching MFCA to them.

Endnotes

1. 'MFCA Forum Japan, established in 2009, has the aim of promoting government-industry-academia collaboration.' 'With the objective of extending the benefits of MFCA throughout Japan and the rest of the world, MFCA Forum Japan was constituted as a place to share the benefits of MFCA, beyond the boundaries of private industry, government and academia, business, governments, researchers, and civil partnership.' The WG is one of their activities to achieve this aim. See the website (<http://www.mfca-forum.com>) for more information.

2. The author of this paper attended all of the WG meetings and has all of the materials used. All of the discussions in the WG were recorded, and the recorded data was transcribed by the author. Details about the date and number of participants are: (1) 8 June 2011, 14:00 - 17:00, 12 participants; (2) 4 August 2011, 14:00 - 17:00, 11 participants; (3) 1 September 2011, 14:00 - 17:00, 14 participants; (4) 10 November 2011, 14:00 - 17:00, 12 participants; (5) 13 December 2011, 14:00 - 17:00, 14 participants; (6) 30 January 2012, 14:00 - 17:00, 12 participants; (7) 9 March 2012, 14:00 - 17:00, 18 participants; (8) 5 April 2012, 14:00 - 17:00, 18 participants; (9) 15 May 2012, 14:00 - 17:00, 14 participants; (10) 13 June 2012, 14:00 - 17:00, 12 participants; (11) 11 July 2012, 14:00 - 17:00, 11 participants; (12) 23 August 2012, 15:00 - 17:00, 9 participants; (13) 3 October 2012, 14:00 - 16:00, 10 participants; (14) 16 November 2012, 14:00 - 16:00, 13 participants; (15) 29 January 2013, 14:00 - 16:00, 14 participants; (16) 28 February 2013, 14:00 - 16:00, 13 participants; (17) 17 April 2013, 14:00 - 16:00, 16 participants; and (18) 5 June 2013, 14:00 - 16:00, 10 participants.

3. This term was developed by the staff of Future Management and Innovation Consulting, which is the office of the WG. 'MOTTAINAI' is a Japanese term related to sustainable development. Because resources are limited, they have to be used as efficiently as possible. If a resource is used beyond what is necessary, the term 'MOTTAINAI' is used. The word became famous worldwide after Prof. Wangari Maathai used this word. There is an Office of MOTTAINAI campaign. See the website (<http://www.mottainai.info>) for more information.

4. 'Material balance', which is one of the fundamental elements of MFCA, is a comparison of the physical quantities of inputs and outputs. MFCA requires the production of 'material balance' through the measurement of the physical quantities of material inputs and outputs. Therefore, 'material

balance' can be used to compare the physical quantities of inputs to products or material loss as outputs, which represents 'resource productivity.'

Acknowledgements

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The MultiCapital Scorecard

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Abstract: The MultiCapital Scorecard (MCS) presents triple-bottom-line sustainability performance in a single schedule. It sets standards of organisational performance (economic, social and environmental) determined by each organisation in its own context. MCS applies the same principles to all areas of impact asking, “How much is enough to be sustainable?” It translates well-established principles into practice, with sustainable performance as a unifying concept.

As reflective practitioners, we see gaps between academe and practice. The deep research of multiple disciplines of academic thought is improving performance measurement in social and environmental accounting. But little emanates from academe to guide practitioners to implement the ideas in practice.

On the other hand, practitioners and thought leaders who recognise the need to act responsibly towards social, environmental and economic stakeholders find themselves without even a cohesive set of principles upon which to base their strategies or performance measurements. Practitioners simply do not have the time to read academic literature to glean the best thinking on sustainability measurement, management and reporting.

Here, therefore, we have attempted to summarise how we believe the MultiCapital Scorecard addresses some gaps. We hope the best of academe and practice come together in the MultiCapital Scorecard to enable organizations to rethink what they really ought to be doing.

We have focused on gaps between:

1. Knowing & doing
2. Perfection & pragmatism
3. Multicapitalism & financial primacy
4. Standardisation & meaning making
5. Top-down & bottom-up action

Context-Based Sustainability¹ (CBS) addresses these gaps for non-financial impacts by providing a principles-based process that organisations can use to establish sustainability performance norms applicable to their own contexts. CBS adopts rigorous academic standards of capital theory, Popperian fallibilism and Rawlsian justice, together with leading sustainability literature to form the framework of principles. These principles allow organizations to start learning from stakeholders about the performance duties and obligations they believe the organization owes them.

The MultiCapital Scorecard (MCS), in turn, extends these principles and processes to include financial stakeholders, thereby completing the Triple Bottom Line (3BL). Furthermore it monitors progression towards becoming sustainable as well as identifying areas of sustainable performance. It introduces weighting of the importance of impacts as well as consolidation protocols for divisionalised entities.

MCS’s open source philosophy ensures that no commercial barriers prevent the academic thinking from becoming action in practice..

One joy of context-based norming is that it produces intensely relevant learning that makes real meaning without standardizing concepts or metrics into a one- size-fits-all form. This bridges gap #2: users set the best standards possible, not awaiting perfect solutions. This starts learning from doing. Moreover, the MCS tests and argues for impact standards that would be applicable if all other entities adopted the same principles. It does not therefore need to wait for a fully sustainable environment to be created.

The MCS recommends engaging all members of the organization who wish to participate. Leadership and decision taking can come from the top of the hierarchy, but stakeholder engagement and the search for sustainability norms should be bottom-up. Beyond Crisis² sets out how to drive self-renewal from every seat in the organization. Inglehart & Welzel³ explain why engaging younger generations in change processes allows new values to feed into more progressive outcomes. MCS lends itself to such bottom-up work.

Genuine Multicapitalism accords no primacy to any particular stakeholder group. MCS’s multicapital materiality perspective introduces an entirely new materiality matrix. It avoids the financial primacy leaning of IIRC’s Framework. It also avoids the doctrinaire monetization of non-financial impacts, offered by leading accounting firms. Instead, the MCS sets sustainability standards of performance in the most meaningful metrics to any area of impact by direct reference to an organization’s own context.

How to implement the MultiCapital Scorecard

The MultiCapital Scorecard implementation generally follows three-steps:

1. Scoping and Materiality
2. Areas of Impact (AOI) Development
3. Scorecard Implementation

1. Scoping & Materiality

1.1. Boundaries of the entity to be assessed are defined. This may include boundaries that extend beyond the financial boundaries of the reporting unit itself. It is also vital to identify early on whether the reporting entity is to be broken down into sub-divisions, and/or conversely consolidated with others into group totals.

1.2. Vital capitals and relevant stakeholders are considered. Identifying the relevant capitals and stakeholders whose well-being depends on them can be an iterative process, but is an essential starting point.

1.3. The materialities of AOIs are identified. The MCS has a protocol to determine absolute materiality. The process then proceeds to accord weights, sizes and progression scores to each AOI, providing a relative materiality to each; encapsulating qualitative materiality in novel form.

2. Areas of Impact (AOI) Development

Once a material set of AOIs has been identified for an organization, each of the associated AOIs must be further researched.

2.1. The specification of Sustainability Norms: We define Sustainability Norms (SNs) as standards of performance for what an organization's impacts on vital capitals must be in order to be sufficient, sustainable and supportive of stakeholder well-being. An SN for water use might say the maximum an organization's consumption of water should be in volumetric terms (e.g., in metric tonnes, determined by reference to some measure of entitlement).

2.2. The specification of Trajectory Targets: Sometimes, the SNs identified for particular AOIs will not be achievable at once, in which case the MCS allows for the specification of Trajectory Targets (TTs) as interim goals.

2.3. The specification of data collection protocols:

Once SNs and TTs have been defined for individual AOIs, data collection protocols for each must be developed in order to acquire information for purposes of populating a MultiCapital Scorecard.

3. Scorecard Implementation

The MCS is a concise, single-screen report that shows the periodic performance of all components (AOIs) of the Triple Bottom Line: actual impacts on vital capitals compared to organization-specific sustainability standards of performance. Once the steps 1 and 2 above have been completed, the formatting of data into the MCS is a simple task. But the simplicity of design is essential to providing governors of organizations an overview of progression. It should not be mistaken for oversimplification. The scorecard allows readers to see ...

3.1. ... which AOIs (and bottom line scores) show a sustainable performance. This is indicated by those impacts scoring 100% (actual performances vs. their corresponding SNs). Once again, this is the only process we know that offers such vital information. Why? Because it is the only process to ask the question: "How much is enough to be sustainable?"

3.2. ... which AOIs and bottom lines fall short of 100%. In their cases, the MCS indicates progression towards SNs. Of course, progression is never linear, but MCS's 7-point progression scale offers approximations ranging from +100% (for full sustainability) to -100% for multiyear regression with no plans to improve. It does

not mean that all capital will be destroyed. It does mean that major changes are needed to steer the organization towards sustainable futures.

3.3. ... aggregated progression scores that offer an "Overall Performance" total. This is a single score that reports the 3BL progression performance of an organization. As an annual performance indicator, it shows broadly whether an organization is moving towards or away from its Sustainability Norms.

As SNs are the context-based sustainability standards of 3BL performance, we consider the whole process a useful management tool to guide organizations towards becoming less unsustainable.

How Else the MultiCapital Scorecard Bridges the Gaps

As the MCS is a completely new development, it is not surprising that it has yet to be tested in many practical implementations. Nevertheless, its principles have been roundly endorsed by two subsidiaries of large multinational companies in which it is being piloted (Unilever and Proctor & Gamble). Both subsidiaries have been actively committed to sustainability principles for many years. Both welcomed the MCS, one as "the best means of operationalizing integrated reporting we have ever seen."

In this regard, it has proven important to users that the MCS exceeds the demands of the IIRC and GRI without requiring compliance with either.

Interestingly, in both companies sustainability teams led the way with the MCS. But once multinational companies mandate IR throughout their international organizations, we expect to see the MCS adopted in sustainability reporting and integrated management.

The MCS has been designed to suit the reporting requirements of multi-divisional organizations. In particular, it allows certain AOs to be mandated centrally, with SNs and metrics also determined centrally as appropriate. So, for Climate Change Mitigation endeavours, the centre may adopt an SN of zero CO₂e emissions by 2050 for all divisions in all countries. Similarly, for its Return on Capital Employed, it may specify 10% after taxes as its weighted average cost of capital and set a zero Residual Income SN on this basis. In each of these cases, this central determination of norms and metrics allows rich data to be collected for absolute performance in the metric determined. The central data collection will then provide better performance information for central and group analysis. For all other AOs, the organization may devolve SN target setting to local levels. Consolidation would then be scores of sustainability and progression performance only. This combination of locally and centrally determined norms supports meaning-making in the organization concerned at both divisional and consolidated levels. Context-based management and integrated thinking can therefore be fostered at all levels within the organization.

We recommend external assurance of the MCS and all its underlying assumptions and workings. Initially, the external assurances will be directed to managers and governors sponsoring the MCS. As integrated reporting becomes more generalized as a reporting practice, the audience for external assurance of the MCS will switch from internal only to the inclusion of external stakeholders of all sorts. We contend that the MCS facilitates more meaningful assurance than any other sustainability process we know because of its principles of transparency, its explicit setting of sustainability criteria, and by asking and answering the question: "How much is enough to be sustainable?"

The preparatory work in the MCS allows validation of its principles and data sources in advance of reporting cycles, thereby taking much assurance work off-line at peak times. Norms prepared in advance of actual performance data allow the numbers to drive conclusions, thereby reducing the scope for divergent opinions. The MCS's innovative materiality approach, too, seems to us to be similarly supportive of professional independent assurance practices.

The MCS also features a double-loop learning process that takes place periodically. We fully expect the external assurance opinions and their workings as well as peer group comparisons to be constructive inputs to such double loop reviews.

Thus, learning to improve has a process and a data source of its own; a bridge to closing the gaps between thinking and doing. Rethinking organizational performance towards sustainable futures starts here!

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Stakeholders and Reporting of Sustainability Accounting Information

Internal stakeholders

- **Higashida & Kitada:** Creating workable performance measures to promote sustainability: Effect of control design on organizational change
 - **Tidemann, Arts & van Tulder:** Measuring sustainable value creation: The CSV practice framework
 - **Perego, Kennedy & Whiteman:** A lot of icing but little cake? Taking Integrated Reporting forward
 - **Gibassier & Verdure Labeille:** A plea for engaged and impactful research: Reembedding organizations and researchers on sustainability accounting
-

Investor stakeholders and reporting

- **Lee & Herold:** Carbon performance measurement and reporting in global logistics industry: Challenges and collaboration opportunities between corporations and academics
 - **Prada:** Syngenta case study: Achieving robust non-financial reporting
-

Other external stakeholders

- **Saviuc, Freudenreich & Schaltegger:** Business model assessment – Taking a stakeholder perspective
 - **Melwisch, Hong & Tok:** Vanguard Future Fit 500 - Redefining corporate value for the century of growth
 - **Pigozzo & McAlloone:** Measuring and maturing the sustainability performance of companies
 - **Neumann & Pangerl et al.:** Measuring the performance of smart cities in Europe
-

Internal control and assurance

- **Cintra:** A survey of sustainability management control practices: Evidence from Brazilian finance executives
- **Viere & Kimsri:** Challenges of integrating site- and product-specific environmental information – observations at a food producing company

Creating workable performance measures to promote sustainability: Effect of control design on organizational change

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Abstract: Our research question is “How does the choice of EPIs influence SCS information flows?” A longitudinal case study indicates that reconfiguring EPIs from measuring output to assessing behaviours extends the flow of environmental information. Especially, the feed forward information flow enhance the organization learning.

I. Introduction

This study discusses environmental management accounting (EMA) and environmental performance indicators (EPIs) as instruments to advance the corporate environmental sustainability agenda. To retain the relevance and usefulness of EMA and EPIs as stakeholder requirements change, practitioners must transform their underlying design infrastructures and how they use managerial performance information ^[1]. Internal barriers and inertia inhibit organizations from initiating changes that are essential to sustainable development ^[2]. Management control systems and sustainable control systems (SCS) influence the path of organizational change through the strategic processes, interplay between external reports and EMA and targeted choice of EPIs.

Managers must identify information that is appropriate for their purposes and tailor EMA to produce it. Their choice of EPI establishes what they wish to control (e.g. behaviour vs. output) and influences information flows (e.g. feedback and feed forward) through which organizations learn from its experience and adapt its current behavior taking into account that experience ^[1]. To advance these efforts, this study undertakes empirical research into how EPI influences organizational change that builds environmental sustainability ^[3]. Its research question is “How does the choice of EPIs influence SCS information flows?”

II. Design/methodology/approach

This study presents a longitudinal case study of how and why Sanden Corporation implemented Environmental Activity Evaluation (EAE) and Material Flow Cost Accounting (MFCA). We collected data through ten two-hour interviews during 2009–2015 with more than twenty environmental and manufacturing managers from Sanden and its subsidiaries, as well as MFCA consultants advising Sanden. Furthermore, we observed the factory at a Sanden subsidiary and inspected internal documents such as EAE formats, shop

floor total productive maintenance bulletin boards and environmental management assessments. Interviews were transcribed for analysis.

III. Points of a case study

Issues at Sanden

In 1996, Sanden introduced ISO14001 throughout its factories and subsidiaries. Its environmental manager instructed each unit to operate its own environmental management system and report goals and performance to the environmental committee chaired by the general manager of the environmental division. However, the environmental manager was not deeply involved with each unit's operations and concentrated more on reports than on behaviours. A few years after ISO14001 was introduced, requirements from stakeholders had become challenging, and it became difficult to achieve environmental goals related to carbon emissions and waste disposal, largely because environmental information was shared only among environmental management and organizational learning about environmental conditions was restricted. We demonstrate that introducing MFCA and EAE and setting appropriate indicators as EPIs enhance the flow of environmental information and organizational learning.

MFCA

Sanden started to introduce MFCA in 2006. Material loss information reported via MFCA showed the mechanisms causing material inefficiency. To promote co-operation in managing material losses, Sanden began to report MFCA information to all related managers. By including material loss as an EPI, MFCA encouraged mutual understanding and initiated behaviours to reduce material losses. Shared information facilitated formation of cross-functional teams from production, R&D, technical and engineering departments and environmental division to discuss the improvements and innovation for the production process and product design. By shifting their waste and/or material management focus from end- of-pipe basis (e.g. results control of environment) to in- process basis (e.g. behavior control of environment), the information flows also changed.

When expanding MFCA company-wide, factory managers were imposed the responsibility for reducing material losses because they control the entire manufacturing process and

can involve different departments in reducing material losses. Factory managers reported their goals, improvement plans and results to the managing board. Thus, top management became more aware and supportive of relationships among production, environment and strategy.

EAE

Assembling a complete picture of environmental management practices was another concern at Sanden. For example, the environmental manager at the headquarter formerly used to collect only factory-level aggregated energy consumption data. To promote process-based environmental management, Sanden needed to reconstruct conventional environmental information systems. EAE was one solution. Sanden not only evaluates environmental performance directly; instead, it assesses management by activity from a checklist of 97 environmental and risk management practices. Managers' scores are reported at the environmental meeting attended by board members and managers of each manufacturing site. Internal reputation and peer pressure motivate managers to attain higher level of operation.

Although EAE is an evaluation tool, it stimulates communication between headquarters and local managers. EAE conveys to factory managers what stakeholders and environmental manager require. After the evaluation, the environmental manager visits factories and exchanges opinions guided by questions on the EAE. Through EAE, factory managers learned to improve environmental management. The environmental manager better grasps the current situation of each factory's environmental management and provides more effective advice.

IV. Findings

The Sanden case study indicates that reconfiguring EPIs from measuring output to assessing behaviours extends the flow of environmental information. EAE extends feedback information flow by assessing more behaviours with considering stakeholders requirements. MFCA also extends feedback information through material loss and the feed forward information flow contributes to organize the team for material loss reduction and to encourage the production process innovation.. MFCA informed multi-functional groups of managers regarding the structures and mechanisms prompting material inefficiencies. Board members, factory managers and their peers assessed and reconsidered environmental management practices using EAE information. Feedback and feed forward information from EPIs helped cross-functional teams to reduce material losses, and competition among factory managers improved environmental conditions.

V. Implications

This study advances the empirical literature investigating how EPIs support organizational change that enhances sustainability (Rodrigue et al., 2013) by discussing the influence of information flows. Furthermore, it extends understanding of the measures of change agents to overcome organizational barriers to sustainable development (Lozano, 2012).

From the practical point of view, our results indicate that tailoring EPI information to measure behaviour aids managers in overcoming resistance to the organizational change that sustainability requires. Path of organizational changes for sustainable corporation is also discussed at the Working Group meeting in MFCA forum Japan.¹ Our results potentially aid dissemination of EMA and MFCA practices among manufacturers.

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¹ The MFCA Forum Japan was established to promote industry-government-academia research to disseminate and elevate the sophistication of Material Flow Cost Accounting.

Measuring Sustainable Value Creation: The CSV Practice Framework

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I. Summary

This paper aims to contribute to the development of a creating shared value (CSV) measurement framework for sustainable value creation of organizations with their stakeholders, integrating business leadership, strategy development and measurement. The paper is derived from research on three related questions: A. what type of leadership is particularly appropriate for shared value creation?; B. what are the main drivers of shared value creation and what stages are discernable in the shared value creation process?; C. how to define and measure shared value creation?

The concept of CSV, as defined by Michael Porter and Mark Kramer (2011), is increasingly adopted by organizations that want to go beyond the apparent dilemma between pursuing business results and creating societal value at the same time. By taking the societal issues and needs as starting point of strategic objectives and capabilities, CSV is aimed at enhancing the long-term strategic competitive positioning and value creation of the firm.

This paper will provide an outline of framework that strengthens CSV's intellectual base, derived from literature and field-research, including a number of case studies from Unilever, DSM and TNO. The proposed CSV Practice Framework allows CSV to be easily implemented in practice.

Keywords: corporate strategy, business models, innovation, sustainability, leadership, value creation, value proposition, stakeholder engagement and transformation processes.

II. The context of csv

Over the last decades, corporate social responsibility or corporate citizenship has been increasingly emphasised in the management and strategy literature^{[2], [6]}. Though CSR originally emerged because of concerns about businesses' detrimental impacts on society (avoiding 'negatives'), the theme of improving society (creating 'positives') was certainly in the minds of early theorists and practitioners^{[2], [18]}. Porter and Kramer's^[7] concept of creating shared value (CSV) intends to build on the original CSR concept and on top of that resolve the conflict between business and social goals, emphasizing the equal importance of social and economic impact. From the perspective of the Logical Framework (LF)^[10], it means that when a firm designs a strategy, it should not only think about the expected

outputs of its activities (products or services that customers buy and create economic value for the company), but also about the outcomes that those outputs lead to (direct effects, e.g. behaviours) and the wider, long-term impact on society caused by those outcomes^[9]. According to LF, shared value is created if a company has a clear strategy on how its activities will lead, on the one hand, to outputs that are favourable for the market and, on the other hand, to outcomes and impacts that are favourable for the society^[16].

III. Sustainable value creation and stakeholder engagement

Value creation is at the heart of any business model; businesses typically capture value by seizing new business opportunities, new markets and new revenue streams^{[1], [14]}. Richardson^[6], based on a wide range of literature, proposes a consolidated view on the relationship between value creation, the value proposition, the value creation and delivery system and the value capture system. From this consolidated view, then, the objective of sustainable value creation is to identify solutions that allow firms to capture economic value whilst generating environmental and social value^[12]. Organizations that focus on creating value for all stakeholders seem to perform better, especially in the long run^{[13] [3]}.

Stakeholder engagement is regarded as the essence of sustainable development and stakeholder relationships are considered an essential part of the firm^[17]. This relational view of business corresponds to trends in organizational dynamics, where the organization is regarded as part of a living network in which value is generated by human connectedness, a sense of common purpose and collaborative creativity.

IV. Leadership and transformation-toward csv

The view that CSV represents a next stage in business thinking and organizational capacity is supported by research showing that firms progress on the path towards a stakeholder value orientation on the basis of a number of progressive stages of development^{[5], [17], [19]}. Van Tulder^[17] developed a phase model that is particularly insightful in supporting leaders and managers understanding at which stage their organization stands and how they can move it forward to the next stage.

Whilst organizations move from stage to stage in the process of sustainable transformation, a key role is played by the mindsets and attitudes of the top leadership of the organization^{[6], [20]}. Sustainability mindsets express the dynamic interplay between companies' leadership and their context. Shared value creation requires acts of inter-organisational and cross-sector collaboration, which requires other types of leadership. The literature describes this alternately as 'connected', 'visionary', 'collective' leadership, next to the obvious term 'sustainable leadership'^[15].

V. The measurement challenge

Measurement of CSV is critically important for the concept to take root. Measurement links performance to value drivers of sustainability and facilitates continuous improvement. Performance evaluation and measurement systems fulfill three vital roles: 1) capture the logic behind a sustainability strategy and facilitate agreement about what is important, how day-to-day activities add value, and how each person contributes to the mission and vision; 2) monitor progress; 3) facilitate the ongoing discussion within an organization that will lead to better performance^[4].

A wide array of value or impact measurement methods for specific purposes has been developed. This research selected a particular measurement methodology based on LF, which brings both analytical clarity and a clear sequential approach^{[10] [11]}. While LF models may seem linear and static, the dynamic relationship between leadership mindsets and shared value creation causes the model to be used as an ongoing learning and development tool.

VI. How to implement csv: the csv practice domains

Since a concise and comprehensive practice framework for CSV has been missing in the literature since the term CSV was launched in 2011^[7], this study has created a 6 step CSV Practice Domain model, designed for organizational leadership to successfully implement the CSV strategy with their organization. The CSV

Practice Framework identifies 6 Practice Domains, with 6 corresponding steps, which form the backbone of effective CSV development and implementation^[16]. It is through the application of these practice domains that shared value creation will occur within the firm on a continuous basis.

VII. Conclusions

The CSV Practice Model is still work in process so we should draw conclusions with some caution. The authors are conducting further research on various aspects of the model and its associated processes. The main (tentative) conclusions are:

- The application of CSV demands an integrated and transformational approach of three processes: Leadership, Strategy and Measurement.
- The Leadership process involves a fundamental reorientation of leadership mindsets, abilities and behavior. A first conceptual mindset model has been identified but needs more research^[15].
- Shared Value is measurable, which facilitates a tangible learning process and enables the alignment of all stakeholders involved. However, it requires a new perspective and integration of different measurement methods and types of indicators.
- The CSV Measurement Process proposed in this study is a first attempt to create such integrated method, but more research and testing will be needed.

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A Lot of Icing but Little Cake? Taking Integrated Reporting

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Abstract: While insightful experiences from the early-adopters of integrated reporting start to accumulate, the development of the field and how integrated reporting may be implemented remains challenging and contested. Several issues are still controversial with no consensus reached on the central purpose about integrated reporting. This paper relies upon a qualitative approach to accomplish two objectives. First, we provide a review of the embryonic academic literature in the integrated reporting field in order to summarize extant knowledge. Second, in response to a gap in the literature on managerial perceptions concerning integrated reporting, we present the sensemaking approaches of three key experts impacting integrated reporting practices at the global level using semi-structured interviews. Our findings suggest that experts perceive the field to be fragmented and believe that most companies currently have weak understanding of the business value of integrated reporting. The experts give insights into how they perceive the field to be progressing despite challenges and on where they see improvements in the diffusion of practices in integrated reporting. Our study contributes to the emerging field of integrated reporting by reframing the existing implementation challenges of integrated reporting into promising and inclusive research opportunities that align the priorities of both academia and business.

I. Introduction

In December 2013, the International Integrated Reporting Council (IIRC) released the first International Framework for Integrated Reporting <IR> ^[1]. In an age when stakeholders and investors are increasingly concerned with a company's holistic performance, the long-awaited <IR> Framework identifies a set of fundamental concepts and guiding principles to more deeply integrate sustainability into corporate objectives and reporting practices ^[2]. In brief, integrated reporting (IR) combines in one report financial and non-financial disclosures of a company's performance. An IR is intended to create an organization's value creation story, by stimulating businesses to think about how they generate value and the capitals on which their operations depend upon in the short, medium and long term horizons. The adoption of IR is further expected to tackle a number of problems presented by conventional, stand-alone sustainability reports, such as the failure to account for all sources of value creation, the complex interconnections

between sustainability and financial performance, and the communication of a company's business model ^{[3]-[5]}.

While insightful experiences from IR early-adopters start to accumulate, the development and implementation of IR and 'integrated thinking' remain a challenge.

Several issues on IR are still controversial and the meaning of IR is contested ^{[6]-[8]}. For example, Flower's ^[9] identifies that IR in practice appears to have shifted away from its original objective of enhancing corporate sustainability performance because current institutional IIRC objectives utilize a weak, business-as-usual reporting framework.

This paper relies upon a qualitative approach to accomplish two objectives. First, we provide a review of the embryonic academic literature in the integrated reporting field in order to summarize extant knowledge. Second, in response to a gap in the literature on managerial perceptions concerning integrated reporting, we present the sensemaking approaches of three key experts impacting integrated reporting practices at the global level using semi-structured interviews.

II. Literature review

To gain a detailed perspective on the extant literature, we conducted a literature search for past studies that examine IR. The review identified a total of 17 studies suitable for inclusion and coded and categorized each article by distinguishing studies focused on antecedents versus consequences of IR. While the former studies focus on the effects generated by the diffusion of IR (as a field of practice) or its adoption (at the firm-level), the latter stream of studies examine key institutional drivers or firm-level determinants of IR. We conclude that much of the embryonic IR-related research investigates the 'supply side' of IR, without attempting to open up the 'black box' of organizational processes that the adoption of IR practices may require. With few exceptions (e.g. ^[10]) academic studies have yet to explore how internal performance measurement and reporting systems have been impacted by the adoption of IR. What is also currently lacking is qualitative insights into organizational processes related to IR practices.

III. Methods

To address this gap in the literature we conduct three interviews with experts and field level entrepreneurs of IR. Purposive sampling was used to select key informants that possess globally acknowledged expertise formed from their experiences leading notable developments in IR ^[11].

IV. Findings

Four key themes emerge from the data analysis: i) experts perceive IR as a diverse and incoherent field; ii) experts perceive that there is a weak business understanding of IR iii) experts agree that the IR field shows progress despite challenges; and iv) experts agree on the critical need to improve field diffusion. Findings from these interviews support many results of extant literature with regard to the current status and problematic issues of developing the field. However experts critically voice concerns of the marginalization of business, an excessive focus on external reporting, and a need to understand IR as a process of organizational learning both at field and organizational level.

V. Discussion and research agenda

Based on the literature review and expert interview we propose a research agenda on IR that addresses these opportunities along two possible lines of inquiry. Firstly we make recommendations for future studies that research the 'information function' of IR'. These recommendations include; further exploring the reactions of financial analysts to ESG information ^[12], ^[13]; researching how different stakeholders interpret and perceive IR and; quantitative analysis aimed at comparing potential effects of IR adopters with regards to, among others, access to capital or cost of equity. Secondly we provide recommendations for future research on the 'transformative function' of IR. Here we argue that a greater focus on research should be on understanding the 'cake' rather than the 'icing' as one of our expert's states. Researchers are invited to; investigate change processes induced by IR with analyses at field-level and; understand specific mechanisms by which change associated to IR and 'integrated thinking' emerges, becomes justified, and diffuses as a field.

VI. Conclusion

By conducting a comprehensive review of academic studies this paper uncovers an embryonic but rapidly expanding body of knowledge on IR. Extant studies are shown to mostly concentrate on the antecedents of IR adoption, with little understanding of processes through which IR adoption may stimulate internal organizational change and the costs/benefits associated with it. In addition, existing research is largely reliant upon limited publically available data and detached from the applied understandings of field level experts.

Through in-depth interviews with three experts and field level entrepreneurs, this study contributes to filling this void by offering insights into how the field of IR practice may benefit from a strengthened engagement with academia.

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A plea for engaged and impactful research Reembedding organizations and researchers on sustainability accounting

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Abstract: Our short paper is based on personal experiences from a professional turned academic and a professional who wants to become an academic. We review in turn, how practitioners can make sense of academic results and how they can better collaborate with academia. Finally, we turn to how academia can provide value to practitioners' enhancement of sustainability accounting performance systems.

I. Introduction

Our paper is a plea to develop a stronger link between academia and practitioners in organizations developing sustainability accountings. Corporations have recently developed stronger sustainability accountings within their organizations. Academic research, which has focused on communication and corporate reporting for the first thirty years, is now turning to newly developed accounting tools for sustainability within organizations. However, connections between the two worlds are scarce and difficult to "make happen". We propose a personal reflection on how to enhance practice via the link with academia, and how academic research would benefit from a stronger link with practice. Our dual reflection comes from a rich set of experience: a practitioner turned academic, and a consultant who teaches regularly within a business school on CSR topics. We expose below examples of collaborations that we have experienced and that we think could be experimented in a near future.

II. How do practitioners use academic knowledge and approaches for sustainability performance measurement?

A. Access to research results

Delphine: When I first read an accounting, organizations and society paper, I had just decided to start my PhD and I thought I would never be able to read or understand academic papers. I can understand the frustrations of practitioners at the opacity of research and the impossibility to translate it back to work. However, there are multiple ways of for practitioners to benefit from research. First, academics regularly publish reports within accounting associations such as ACCA, CIMA, IMA that are accessible and targeted at practitioners. For example, my colleagues and myself

are currently finishing a report on the role of accountants in implementing integrated reporting within organizations. Moreover, academics publish books that are accessible to practitioners with case studies or resources for implementing sustainability accounting. For example, EMAN has published numerous books in the past years, the next one being on "climate change accounting". Additionally, there are several academic journals that are specially targeted at a mixed audience from practitioners and academics, such as "Sustainability, Accounting, Management and Policy Journal" or "La Revue Française de Gestion". Finally, many researchers now publish on personal blogs their research results or commentaries (see Carol Adams, or myself), or on professional blogs such as the one from the Harvard Business Review.

Odile: As a practitioner, when I'm in a company as a consultant, I use equally strong metaphors or real stories and academic sources to set a sturdy ground. It depends on who is in front of me, what is their background. CSR still seems fuzzy and somehow useless to the main part of the people I meet. For people who don't have University degree, academic knowledge is a hazardous choice, because it seems beyond their ability to check: if the trust is already well set up, it can give some legitimacy to my advice, but it is a card that I've learn to play with caution. But for my personal enlightenment, and to build my tools or stories, I use academic knowledge an approaches. The first filed of academic research that I've used was the work of the Chile economist Max Neef about the definition of poverty, to shed some light on the concept of added value that is not of financial nature. Since then, I had the chance to follow the teachings of several researchers in the field of CSR and performance measurement, so it helped me to decipher their academic papers after the lecture.

B. Benefiting from the "up-to-date" knowledge of academics

Often, academics follow very closely a field of research, such as sustainability accounting, and become experts on their area. They have up-to-date information, and collect regularly information to build on sharp knowledge. Practitioners often don't get the chance to follow closely how one particular field evolves, and read research and reports on the topic. For example, I regularly exchange with the company managers I worked with for my research on topics I think they are

interested in, as we have a more “global” view of our field. I believe this could be enhanced by having a specialized website targeting practitioners, which is something I will develop later.

III. How do practitioners can better collaborate with academia?

Practitioners should be less scared of opening their doors for academics to come and do research at your place. Many academics now, are also former practitioners.

A. *Trigger intervention research*

Academics are often allowed to practice “intervention research” which consists in doing consultancy work, and writing a research out of it. This allows both sides to benefit from each other. Consultancy work from academics can build on new ideas taken from research, and academics can refer back from their experience in their papers.

B. *Allow a PhD student to do “participant observation research”*

Participant observation research is scarce and rare are the organizations to trust a PhD student to come and work within their organizations and publish research out of it. In France, there is a program financed by the state, the “CIFRE contract”, which allows an organization to welcome a PhD student as an employee, and to get financial help from the state. In management studies, and in sustainability accounting more particularly, this scheme would enhance deep-rooted and engaged research.

C. *Non-participant observation*

If practitioners do not one consultant work, nor a PhD student, they can also invite researchers for non-participant observation research. This is the best way for researchers to be close to “action”, without intervening into practice. Even there, practitioners benefit from informal conversations with academics, and academics often present their research back to practitioners. This allows for interaction, discussion, and often practitioners are happy to reflect back on projects.

Odile: I always try to make my clients realize that it is in their interest to let me introduce them another person with me during my interventions for them. I did work with a journalist, a fellow consultant, an expert in the special attention to disabled people in hotel sector who was himself a deaf person, and a double PhD who was training in my agency, but I never managed to make any company welcome an academic as an academic. But on the other hand, managers come happily to listen to academic lectures, even within the academic institution when they are properly invited through their own networks (business associations, staff council committee events...).

I used to manage the scientific committee of a business association, who organised such events. One of the main lead of collaboration we were trying to follow was to make practitioners participate to the design of research questions for the recurring funding applications that set the pace of any researcher. The association and the practitioners were offering a field to qualitative research, and the researchers were using this field to orient their

studies. I found this way of collaboration very rewarding for both sides. It is quite close to another kind of application, the European specific call for innovative projects where it is compulsory to have a mix between academics, public bodies and practitioners to give a field for the in vivo testing of a new approach or process. Often, practitioners found too time consuming these kind of application process, but it gives a quite interesting experience of the real life within a company when the company begins to try to address the needs of a wider range of stakeholders.

Last time I really had to dig into recent academic research was to build a sturdy approach of strategic environmental assessment of a transnational cooperation program of the UE. It was important to show that the assessment grid was not just a fantasy from myself but had real sources, important for the EU authorities and for the public bodies in charge of this cooperation program.

IV. How do academics collaborate with companies/practitioners in order to add value to sustainability performance measurement in practice?

Delphine: I have followed, ever since I turned from “practitioner” to “academic”, the same line: my work has to have an impact. My research cannot stay in books and academic journals. To follow this trend, I will talk about several projects that I have conducted. First, I did my PhD as a “participant observer”. That is, I worked 12 months for a French company as an employee in the “nature finance” team. I have managed to re-build trust with new teams of practitioners, and have been looking at a water accounting tool and will soon start a new project in a medium size company implementing a new sustainability accounting tool.

Second, I try to disseminate the rich access I am allowed to get from practitioners. I wrote a case study for teaching students, out of this experience. I also wrote a book chapter for the EMAN book “climate change accounting” (which is accessible to practitioners) and published a paper in a practitioner/academic journal (SAMPJ). I write a blog as well on sustainability accounting topics. I attended a practitioner/academic conference organized by ADEME in January 2015 (the French environmental agency). At Toulouse Business School, I also organized a conference on integrated reporting, with an academic and a practitioner guest speaker,

to the attention of students and practitioners. I have two projects to enhance collaboration: one is a course book on sustainability accounting; the other is a research chair.

V. Conclusion

We believe there are many areas where collaboration for sustainability accounting practice and research could be enhanced. Associations such as EMAN and CSEAR could serve as better transmission belts of organizations willing to share their practice with academia, and academics looking for “fields” or consultancy work.

Practitioners should also our allies in putting pressure on business schools to develop curriculum in sustainability accounting. Academics welcome practitioners to teach or testimony in their courses or during conferences. Research chairs or research centers are also a way to develop close links between practitioners and academics. Conferences such as this one, or the one organized by ADEME are also shared space to exchange on a common topic of interest. Management research should always be impactful for practice.

We should reinforce cooperation through developing common spaces (conferences, journals, shared associations, common books, courses developed together (MOOCs)) for interaction, targeted spaces to share each other’s concerns and issues (websites, blogs), rebuild trust for full field access to new developed sustainability accountings, and commonly lobby to continuously build space within academia for sustainability accounting research, and within business school education for sustainability accounting courses.

Carbon performance measurement and reporting in global logistics industry: Challenges and Collaboration opportunities between corporations and academics

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Abstract: Corporate carbon emission measurement and reporting has been increasingly adopted within the global logistics industry in the last twenty years. However, companies within the global logistics industry do not follow the same carbon measurement and reporting approaches. This short paper explores the similarities and differences of carbon performance measurement and reporting in the global logistics industry based on the three cases of the global players, FedEx, UPS, and DHL. More importantly, these cases serve as a foundation to address the collaboration opportunities between business practitioners in corporations and academic knowledge.

I. Introduction

Corporate carbon emission measurement and reporting has been increasingly adopted within the global logistics industry in the last twenty years^[1]. This increasing interest in carbon emission measurement and reporting is driven by the growing economic and business relevance due to regulatory, societal and market influences^[2]. However, companies within the global logistics industry do not follow the same carbon measurement and reporting approaches^[3]. Although there is a growing body of research in the fields of sustainability performance measurement, in particular carbon emission performance measurement, there is no 'one size fits all' approach.

In the identification, measurement and reporting of carbon performance for global logistics industry, sustainability accounting can provide an avenue for addressing environmental and economic activities. As Lee and Wu^[18] point out, 'measuring sustainability performance, especially carbon performance is a challenging task for corporate accountants and managers (p.362)'. In corporate practice, carbon performance issues are often neglected or partially addressed, and not fully integrated with information and management systems^{[15], [17]}. Despite the importance of integrating carbon performance in global logistics activities, there is a lack of available approaches and tools to measure and report carbon performance in the global logistics sector.

This short paper aims to address key challenges of carbon performance measurement and reporting in global logistics industry, and to explore three cases of global players, FedEx, UPS, and DHL to demonstrate current practice of carbon performance measurement and reporting. More importantly, this paper addresses the collaboration opportunities between corporations and academics to investigate (i) key roles of corporate managers in different departments and corporate accountants in carbon performance measurement and reporting; (ii) carbon emissions boundary setting and measurement approaches in the sector; (iii) the usefulness and important value of sustainability accounting for carbon performance measurement and reporting in the sector.

II. Carbon performance measurement and reporting: three case studies in global logistics industry

According to the World Economic Forum, the logistics industry accounts for around 5.5% of global carbon emissions^[4]. Global logistics companies, as facilitators of global trade, can thus be regarded as a significant source of carbon emissions. This study uses three leading global logistics companies, the so-called 'integrators', namely Federal Express (FedEx), DHL Express (DHL) and United Parcel Service (UPS) to examine similarities and differences between carbon measurement and reporting approaches. All three companies are fully integrated across the four main transport modes (air, rail, road, and ocean)^[5]. In addition, all three companies are dominant players in the express business service being able to service the majority of the world within 48 hours^{[6], [7], [8]}. The resources and systems of all three exemplars are extensive in terminals, means of transportation, handling equipment, etc. To a large extent, the global network is based on air transport mainly using their own aircraft, which ensures high quality and speed, i.e., time is an extremely important factor^[16]. The extensive use of the network with the heavy dependence on fossil fuels results in heavy carbon emission output and leads to pressure to disclose carbon emissions^[3].

However, all three companies have similarities and differences both in measuring and reporting. The data for this comparison is mainly taken from questionnaires from the Carbon Disclosure Project (CDP) which was sent to the companies. All three companies have provided detailed and comprehensive information about their respective carbon measurement and reporting approaches, including carbon reporting strategies, organisational structure, control approaches as well carbon reduction targets ^[3].

FedEx, UPS and DHL are all following the 'Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)' provided by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). Moreover, all companies have made the case of climate change integrated into their business strategy and deal openly with relevant stakeholders ^[6], ^[7], ^[8].

To measure the carbon management targets, FedEx, UPS and DHL have implemented 'intensity' targets compared to 'absolute' targets. An 'absolute' target would reduce the total amount of carbon emissions and management fears that this would constrain the companies' growth. Therefore, an 'intensity' target is preferred, which measures the target as a decline in carbon emissions relative to the level of logistical activity ^[19]. However, companies need to decide against which variable the reduction will be measured. Although FedEx, UPS and DHL have adopted the 'intensity' approach, their variable differs. FedEx defines its carbon reduction target in ton-miles of freight movement ^[9], DHL relates carbon emissions to the total square meter of space in its warehouses ^[10] while UPS has developed the most detailed ratios, one for each of its divisions and each assigned a different weighting factor ^[11].

III. Key challenges in carbon performance measurement and reporting practice

With the 'Greenhouse Gas Protocol, companies can choose different carbon measurement and reporting schemes for their carbon emissions ^[12]. These different schemes provide, inter alia, guidelines to set operational boundaries for carbon emissions reporting. In our view, a company can choose between two different control approaches, namely either 'financial control' or 'operational control'. In both wholly-owned and joint operations, the choice of approach changes how carbon emissions are categorised when operational boundaries are set and therefore influence the amount of carbon emissions to be reported. While FedEx and DHL are following the financial approach, UPS is following an operational approach. Thus, the carbon emissions reporting practices are vary in the global logistics industry ^[3]. From an academic perspective, it is still unclear what factors and/or forces influence the entrenchment of one carbon measurement and reporting approach over another.

Another important point to address is about the reporting of Scope 3 emissions within the global logistics company. The "Greenhouse Gas Protocol" ^[13] distinguishes three GHG emission categorising emissions into Scopes 1, 2 and 3. Scope 1 emissions are all direct GHG emissions caused by owned or controlled facilities of an individually regarded company. Exemplary processes are e.g. burning of fossil fuels, transportation by company owned vehicles or chemical and physical processes necessary for producing electricity. Scope 2 emissions then refer to those indirect GHG emissions caused due to the supply of purchased electricity generated outside the system boundaries. Scope 3 emissions are not caused directly by the company itself, but indirectly by its activities. This includes various categories such as purchased transportation, fuel-and-energy related activities, business travel, etc.

For global logistics companies, purchased transportation by air, rail, road and ocean accounts for the largest source of Scope 3 emissions ^[9], ^[14]. This leads to uncertainty: as sub-contractors usually do not disclose information on fuel consumptions, Scope 3 emissions are largely based on complex calculation models and scenarios taking into account data from operational systems such as origins, destinations and routing ^[10]. Moreover, based on the data from CDP ^[3], only UPS and DHL seem to report their full Scope 3 emissions from purchased transportation. FedEx acknowledges the relevance of this data, but is not yet able to calculate it fully as it only contains dat

Proceedings of the first WBCSD and EMAN joint international sustainability accounting symposium, Geneva, 2015 from the freight subdivision in the US and Canada ^[7].

As a last point, this study addresses the differences in the organisational structure. UPS has appointed a Chief Sustainability Officer (CSO) who has a direct reporting line to the Chief Operating Officer ^[8]. He chairs the UPS Sustainability Steering Committee and is responsible for the UPS Environmental & Regulated Goods Compliance. DHL has also appointed a dedicated person, the head of 'Corporate Communications and Responsibility' department, who sits with the Board of Management which is chaired by the CEO ^[6]. In contrast, FedEx delegates the management of environmental performance onto the operating companies, but has implemented 'Sustainability Impact Teams (SITs). These SITs report to the FedEx Enterprise Sustainability Council (FESC), which is chaired by the Vice president for Environmental Affairs and Sustainability^[7]. In our view, it is not clear yet whether different organisational structure may (or may not) contribute to carbon management, more importantly, carbon efficiency and business performance or not.

IV. Collaboration opportunities between corporations and academics in the sector

As climate change becomes a more pressing issue for society and companies around the world, policy makers are faced with tough decisions. There is a need to understand the similarities and differences of measuring and reporting carbon emissions and strengthen the link between academia and practice. This is particularly important for global logistics and transportation companies. Every successful company in the sector knows that the cost and quality of its products depends on costs and quality in the supply chain. Many companies also understand that assessing their greenhouse gas emissions is a productive way to identify cost savings related to energy use and operating efficiency. Until now, few companies combined these two perspectives (i.e. carbon efficiency and cost savings). In our view, sustainability accounting, in particular carbon management accounting and/or environmental management accounting, can provide more structured approaches and tools to achieve both carbon efficiency and cost savings simultaneously. More specifically, academics 'with the outsider view' in the field of sustainability accounting are well equipped with extensive knowledge, tools and approaches with limited corporate accessibility while business practitioners 'as insider' have better understanding and experience on specific business field with limited knowledge and application access. If academics and business practitioners can work together to improve corporate carbon management practices, there will be much positive synergy effect in the outcomes.

The following questions may address key collaboration opportunities between academics and business practitioners:

1. Who and/or which corporate department/team are in charge of carbon emission data collection, boundary setting, measurement, and reporting, and for what purpose?
2. Do the corporate staff or team have sufficient knowledge and understanding on carbon management accounting in monetary and physical term application in carbon emission measurement and reporting?
3. How to identify carbon risks and carbon opportunities from carbon management?
4. How to achieve carbon efficiency and cost savings opportunities using sustainability accounting tools and approaches?

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Syngenta case study: Achieving robust non-financial reporting

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I. Introduction

Corporate non-financial information is becoming increasingly relevant for internal and external stakeholders. Non-financial information, which is sometimes also called extra-financial, sustainability or corporate responsibility information, is quantitative or qualitative information on a strategy, policy or business activity pursued by a company towards achieving its economic, environmental and social goals. Relevant non-financial information enhances the understanding of the company’s activities, challenges and opportunities. External stakeholders and internal managers use this information to measure performance and make decisions about the company. They should therefore have confidence in it.

The quality of the information is a reflection of the maturity of the internal control environment of a company. Non-financial reporting processes and internal controls have traditionally been less mature than those existing in financial reporting. Due to the increased business relevance of non-financial information, companies are recognizing the need to also have in place a more robust internal control environment for non-financial information. Companies should ensure that processes, systems and controls support the measurement, gathering, consolidation and reporting (internally and externally) of reasonably accurate, complete, valid, timely and relevant non-financial information. To achieve this, much can be learned and leveraged from the financial reporting community where these concepts and practices have already been in place for a long time.

II. Controlling non-financial reporting

In 2013, a team from the World Business Council for Sustainable Development (WBCSD) Future Leaders Program made a first attempt at applying an internal control methodology used in corporate financial reporting to non-financial reporting [1]. Based on the underlying principles of the 2013 COSO Internal Control-Integrated Framework, the team developed the “Internal Control Framework for Non-Financial Reporting” (the Framework) [2].

The Framework guides companies on how to develop robust internal controls for non-financial reporting. In this context, an internal control is a process, effected by a company’s board of directors and executive management, designed to ensure that reasonably complete and accurate data is measured, gathered, consolidated and reported, and that related rules, procedures and policies are followed [3].

Based on the structure of five components and 17 principles outlined in the 2013 COSO Internal Control- Integrated Framework (figure 1), the Framework sets objectives required to ensure leading non-financial reporting. For example, it emphasizes the importance of setting the tone at the top to influence people’s control consciousness, of identifying and reporting on material topics to stakeholders¹ and of implementing internal controls to generate high-quality data.

FIGURE 1: COMPONENTS AND PRINCIPLES OF THE 2013 COSO INTERNAL CONTROL-INTEGRATED FRAMEWORK [2]



III. Syngenta’s path to robust non-financial reporting

With more than 28,000 employees in some 90 countries, Syngenta’s business serves and sustains one of the world’s largest industries: agriculture. Today the industry is grappling with one of the toughest challenges on earth – feeding the world’s fast-growing population [4]. In September 2013, Syngenta (www.syngenta.com) set six ambitious quantitative targets to help the world’s growers rise to that challenge in a sustainable way. Syngenta calls this commitment “The Good Growth Plan”.

The Good Growth Plan (www.goodgrowthplan.com) is an integral part of Syngenta’s strategy. It ensures that Syngenta focus its business on understanding and meeting its customers’ and stakeholders’ most pressing needs. Syngenta focuses its integrated capabilities on six crucial

¹ Companies could report on many topics to stakeholders. In the context of non-financial reporting, material topics are those that are reasonably considered important for fairly reflecting the company’s economic, environmental and social impacts, or influencing the decisions of stakeholders, and, therefore, internally or externally reported. Performance indicators are put in place to measure progress on the activities associated with material topics.

issues – land productivity and input efficiency, soil fertility, biodiversity, smallholder inclusiveness, product stewardship and supply chain sustainability, so that it can deliver better solutions that use fewer resources while protecting nature and helping people in rural communities live better lives. The Good Growth Plan's overall mission is to improve the sustainability of agriculture and of Syngenta's business ^[4].

Shortly after the launch of The Good Growth Plan and with the support of its Executive Committee, Syngenta embarked on a project to improve its non-financial reporting. Guided by the objectives outlined in the Framework, Syngenta established a project steering committee, which includes the Head of Public Policy and Sustainability and the Head of Group Financial Reporting among other key individuals. It also conducted an in- depth gap assessment comparing existing non-financial reporting processes in the company to the 17 principles outlined in the Framework and developed an action plan with short-, medium- and long-term actions which were prioritized based on the magnitude of the gaps identified and the materiality of the key performance indicators.

Immediate actions included defining a formal governance structure for non-financial reporting and seconding a resource from the financial team with experience in internal controls and financial audit to support the Public Policy and Sustainability team, which is where the responsibility for non-financial reporting including that for The Good Growth Plan, lies. Utilizing financial reporting concepts to guide the work, the initial efforts focused on designing, implementing and documenting reporting processes and controls for the performance indicators associated with The Good Growth Plan. The long-term objective is to work towards bringing this higher level of rigor to all non-financial key performance indicators.

Key challenges that were overcome in the first year were: (i) the complexity of establishing rigorous reporting processes and collecting reliable data beyond the company boundaries, as most data for The Good Growth Plan are generated at the farm level; (ii) the uniqueness of the performance indicators of The Good Growth Plan and the unprecedented non-financial reporting approaches required; and (iii) the required change in mind-set among the individuals involved in reporting, who are experts in their respective technical fields (e.g. biodiversity, product stewardship, labor rights) but not familiar with concepts such as internal controls and assurance of information.

Syngenta has been conducting limited assurance on its externally reported non-financial information for over 10 years. In December 2014, the Board of Directors approved the recommendation to take the reporting rigor for The Good Growth Plan to the next level - similar to that found in financial reporting - making Syngenta one of the few companies in the world to strive for reasonable assurance for non-financial data ^[5].

In March 2015, Syngenta reported progress on the first year of The Good Growth Plan in its Annual Report 2014

^[6]. In collaboration with the Open Data Institute (ODI, <http://opendatainstitute.org/>), it also published a broad range of data on the six commitments of The Good Growth Plan. The data are searchable, useable and shareable via the Internet. For example, datasets include 2014 baseline information for agricultural efficiency indicators collected on 3,600 farms in 41 countries, representing about 200 crop-climate combinations. It is the first time information at a crop level has been made public in this way by a commercial organization. Definitions of datasets and the description of reporting processes were also made publicly available. Syngenta aims to increase transparency and engage in dialogue with its stakeholders ^[7], ^[8].

As of August 2015, Syngenta has already significantly increased the robustness of its non-financial reporting processes and the quality of data, and is on track to achieve reasonable assurance on The Good Growth Plan data for the upcoming year-end reporting. Key actions included the increased number and quality of internal controls, clear guidance on evidence required to support reported figures, refined documented procedures and an internal audit readiness assessment with half-year data. Performance measures of the Syngenta Executive Committee now also include metrics associated with the targets of The Good Growth Plan. Syngenta has also started to work on improving the rigor of reporting processes of other material performance indicators beyond those of The Good Growth Plan.

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Living up to the Partnership Promise: Key Questions and Considerations in Measuring the Impact of Public Private Partnerships

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Abstract: PPPs are expected to deliver improved and innovative solutions for economic, social and environmental problems. However in the last years the debate about PPPs has been growing increasingly critical. There is limited evidence to what extent partnerships are successful in tackling wicked problems. So far, PPP research has focused on what they are about (“what” questions), the motives and drivers behind PPPs (“why” questions), and the process of forming and implementing PPPs (“how” questions). The aim of this study is to shed light on whether and how much difference PPPs make to society (“so what” questions). This study delves into the challenges of measuring the impact of PPPs and outlines the essential questions that need to be asked in evaluating PPPs. These key questions in the impact evaluations are the starting point of improving the impact of PPPs on society.

I. Introduction

In 2015 the Millennium Development Goals (MDGs) are followed-up by the Sustainable Development Goals (SDGs) which are intended to set the agenda for the development discussion for all countries in the world until 2030 (United Nations, 2014). In both initiatives partnerships have been presented as a separate goal (MDG8 and SDG17), but perhaps most important as a means for effectively achieving all goals that are more complex than ever. Public-Private Partnerships (PPPs), also referred to as ‘cross sector partnerships’, are expected to fill institutional gaps and voids that hybrid organisations such as social enterprises, semi-public or semi-private (regulatory) organisations are not (or to a lesser extent) able to provide (Kolk et al., 2008; McQuaid, 2000). North-South partnerships thereby can fill the ‘mutuality gap’ (Johnson & Wilson, 2006). A PPP combines and adds to the strengths of various societal organisations without compromising them, keeping them independent, by sharing risks and responsibilities, creating new organizational means for addressing complex problems by leveraging financial and non- financial resources of actors across different sectors (Glasbergen, 2007; Brinkerhoff, 2002a; OECD, 2006).

The popularity of PPPs is often described as a response to the increasingly complex problems in our world, and the inability of current organisational forms to tackle them due to the market, governmental or third sector failures that they face (Austin, 2000; Kolk et al., 2008;

OECD, 2006; Seitanidi and Crane, 2013; Selsky and Parker, 2005). Consequently, PPPs are expected to deliver improved and innovative solutions for economic, social and environmental problems, via the combination of complementary capacities, capabilities and resources of organizational actors across different societal sectors (Brinkerhoff, 2002b; Huxham and Vangen, 2005).

In contrast to PPPs created out of the needs of the individual partners themselves (‘coalitions of the needy’), the PPPs that we focus here on have emerged because of the explicit desire of all parties involved to create value for society (‘coalition of the willing’) (Austin and Seitanidi 2014; Tennyson, 2005). These are thus not the types of partnerships that for example are created to ensure a license to operate for a private firm. The definition of the success of this PPP for that private firm would not lie with the effectiveness of the actions in creating value for society. Impact focused PPPs are the type that we focus in this first step in discussing the measurement of their impact. They are the types of ‘real’ partnerships that are characterised by a balance of what all partners give and take in terms of risks, resources and responsibilities (Glasbergen, 2007).

In the last years the debate about PPPs has been growing increasingly critical. Some question whether PPPs are simply the newest “panacea” (Barnes and Brown, 2011; Kolk, 2014). These critics argue for example that gaps in regulation and governance (Rivera-Santos et al., 2012) or democracy (Bäckstrand, 2006) are not easily, if ever, filled by PPPs. Some even state that PPPs have arguably crowded out other relevant interest groups or introduced “solutions” that are as controversial as the problems they intended to address (Babiak, 2009; Mert and Chan, 2012).

Over the last two decades there has been a dramatic increase in the management and policy literature on PPPs in particular on the soft side of partnerships (Branzei and le Ber, 2014; Gray and Stites, 2013; Van Tulder et al., forthcoming). However, the quality of this research has been questioned as well (Hull et al., 2011; Margolis and Walsh, 2003). In 2003 Wettenhall argued that ‘The belief that partnership refers to a good thing is much more a matter of faith than of science.’ Recent PPP research is characterized by a set of widely dispersed and multi-disciplinary theoretical roots (Gray and Stites, 2013; Hull et al., 2011). This has resulted in fragmented research that lacks a solid theoretical foundation, is often ideologically based, and is frequently unable to create concepts that could be used sufficiently in practice

(Barnes and Brown, 2011; Brinkerhoff and Brinkerhoff, 2011; Selsky and Parker, 2005). Despite the common premise that PPPs are formed in response to social problems that are too complex for single organizations to address, there is a void in both efforts and knowledge to actually evaluate to what extent these partnerships are successful in tackling these problems (Babiak, 2009; Provan and Milward, 2001).

Although the anticipated (ex ante) benefits for the actors involved in PPPs have been extensively discussed in the literature, realized (ex post) outcomes and impact for society are often neglected (Arya and Lin, 2007; Leach et al., 2002; Provan and Milward, 1995). The efforts that have been made to date to evaluate the impact of PPPs are either anecdotal (Babiak, 2009; Gray and Stites, 2013) or they lack the necessary methodological rigour that is needed to draw causal conclusions about the role of the PPPs in the creation of social value (Bouman, et al., 2013). Measuring the impact of PPPs is burdened by a range of specific measurement problems. Whilst impact measurement of a single organisation is already complex (Salazar, Husted and Biehl, 2012), PPPs face additional challenges such as fuzzy goals, complexity at all levels, a focus on wicked problems, a lack of consensus on core measurement concepts and steps, and the contentiousness of evaluations.

Considering the prevalence of PPPs, and the hope that is being put into their ability to tackle numerous problems that threaten our world today, there is an urgent need to increase our knowledge about the impact of PPPs. Evidence is needed to inform and support the legitimacy and credibility of PPPs as an effective and efficient approach to solving complex social and environmental issues, as well as in determining their necessary limits. Existing research on PPPs is too limited to substantiate the claims that are being made about the effectiveness of PPPs (Sciulli, 2008). Therefore, impact measurement of PPPs is needed. Moreover, not evaluating the impact of PPPs creates another, and arguably even more serious, problem: if we do not know whether and how much impact specific PPPs have, we cannot learn how

PPPs can become more effective (Kolk, 2014). Our paper is therefore a response to the current lack of knowledge about the actual impact of PPPs on society, and how to measure this impact.

So far, PPP research has focused on what they are about (“what” questions), the motives and drivers behind PPPs (“why” questions), and the process of forming and implementing PPPs (“how” questions). The aim of this study is to shed light on whether and how much difference PPPs make to society (“so what” questions).

II. Impact measurements for ppps

Impact measurement for PPPs should provide insight in the results of the PPPs and, more importantly, will create the opportunity to improve their performance. The impact of PPPs is most often created in a multitude of ways, and can be viewed from different perspectives. Four levels of analysis can be identified: (1) individuals within the partner organisations, (2) the partner organisations themselves, (3) the PPP and (4) society. Each level of analysis has an impact on different dimensions, and measuring the impact of each level requires a different set of metrics.

The impact measurement process itself can be captured in six key questions (table 1). These are the core questions that form the steps of any impact measurement process, regardless of the methods that one ends up using to collect and analyse the data: (1) What is your evaluation scope?, (2) What is the underlying logic?, (3) Which impact effects to measure?, (4) When to measure impact?, (5) How to collect and analyse impact data?, (6) What to compare the impact to?.

TABLE 1 – KEY QUESTIONS OF THE IMPACT MEASUREMENT PROCESS

Question 1	What is your evaluation scope?
Question 2	What is the underlying logic?
Question 3	Which impact effects to measure?
Question 4	When to measure impact?
Question 5	How to collect and analyse impact data?
Question 6	What to Compare the impact to?

Question 1: What is your evaluation scope?

The scope of the evaluation firstly refers to either a performance or an impact evaluation, and can be further specified by the order of impact of interest. PPPs pose unique challenges for both performance and impact evaluations. Analysing the performance of PPPs is much more complex because of the multiple levels of analyses that are part of creating the impact of a partnership. Most studies conclude that the impact of a PPP needs to be addressed at three levels of analysis: the community, the network, and the organization (Babiak, 2009; Provan and Milward, 2001). However, recent research also proposes a fourth level of analysis: the individuals within participating organizations

(Kolk 2014; Seitanidi, 2009). Our levels of analysis comprise four orders and include 1) individuals within the partner organisations, 2) the partner organisations themselves, 3) the PPP and 4) society.

Question 2: What is the underlying logic?

Underlying the impact value chain is the stipulation of the relationship between the impact and the action. The description of this relationship is also referred to as the theory of change, the logic that outlines how the action is expected to produce the desired impact (for examples see Patton, 2010) (Ebrahim and Rangan, 2010; Rogers, 2008). Close cousins to this theory of change are the logic framework or in short log frame and the intervention logic. By making the theory of change explicit, the core logic is exposed facilitating the next step of revealing the core assumptions that are critical to the success of the action (e.g., lack of a nutritious breakfasts negatively influences the ability of children to learn). This theory of change is the foundation for the evaluation, as it exposes what the evaluation should focus on and how it can produce timely and relevant information.

Question 3: Which impact effects to measure?

The theory of change reveals how the specific focus of the evaluation can produce the most meaningful information to optimise, improve or test the effectiveness of the actions of the PPP. However, once this focus is chosen, it still has to be decided which exact effects will be measured. This is not an easy process, mainly because one wants to include as many effects as possible but there are always limitations in terms of the availability of data, data collection costs and unforeseen effects. As a second step it is therefore useful to make an impact map.

To map all the effects one can firstly make an overview of all the stakeholders affected (for good examples see Patton, 2010). For each of these stakeholders, one can map the effects at the output, outcome and impact level (for a good example see Haugh, 2006). Here, it is important to consider both intended and unintended effects. In the end, any impact assessment and evaluation, whether it makes use of qualitative or quantitative methods, and of whatever quality, is restricted by the choice of effects that are included and excluded. As in reality, any action has many effects, and these have many ripple-down effects; choices thus need to be made about which effects to include and exclude in the measurement. In the end, an assessment or evaluation is only able to conclude on the effects that are included in the analysis. Impact assessments and evaluations are therefore almost never complete, and have a subjective component as they are restricted by the human choices of the effects that are included.

Question 4: When to measure impact?

Before starting with one's own measurement, it is useful to consult the existing evidence base to learn to what extent evidence exist for similar actions. The theory of change is a crucial element in doing this, as its assumptions can be viewed as the evaluation questions that can be answered either by sufficient existing evidence or by creating new evidence. For example, if the relationship between an increase in nutritional status and staying in school is well established, one might decide not to conduct an impact evaluation and simply monitor how many breakfasts are distributed.

The evidence base for the actions of the PPP exists of evaluations of similar actions by other organisations. Because PPPs often respond to wicked problems, evidence is likely to be scarce. However, there may be some evidence for specific components for actions or certain crucial assumptions. For example one of the assumptions in the malnutrition and hidden hunger programs is that the nutrition a child receives in the first 1,000 days after conception effectively determines whether it is blessed or cursed for the remainder of its life, irrespective of any future healthy diet (McKinsey, 2013). There are several impact evaluations available that have indeed found that early childhood nutrition is crucial for their future life. The study from Alderman et al. (2006) showed that if the median preschool child in their sample, children from civil war and drought shocks regions, had the stature of a median child in a developed country, by adolescence, he or she would be 4.6 centimeters taller and would have completed an additional 0.7 grades of schooling.

The logic with which the PPP hopes to change actors in the system or entire systems might also be partially supported by existing evidence. Increasingly, initiatives are arising to bundle the evidence in certain fields, such as the Clearinghouse for What Works which focuses on education interventions (mostly in the US), or the Jameel Poverty Action Lab (J-PAL) database of impact evaluations of international development interventions.

Question 5: How to collect and analyse impact data?

Once it has been decided what the scope is of the evaluation (step 1), what the theory of change and the corresponding assumptions are of the level(s) of interest (step 2), the effects are mapped (step 3) and the evidence base has been consulted (step 4) it has become clear what the evaluation questions are that require the collection of primary data. A lot has been written about how to formulate productive evaluation questions that create meaningful results for all stakeholders involved (Patton, 2010). Increasingly, attempts have also been made to discuss the pros and cons of various evaluation designs (for a useful discussion see for example Duflo et al. 2007; Ton, 2012; White, 2010). However, what constitutes a good impact evaluation varies for the different

impact loops as the type of data that needs to be collected, the data collection instruments and the methodological options for the evaluation design differ greatly.

There are two primary considerations when determining whether to conduct an impact evaluation. First, the ability to assess or evaluate the impact in a rigorous way (whether qualitatively or quantitatively) should be considered. If there is no possible way to produce robust data, or one cannot conduct an evaluation with robust results, one might be better off not evaluating at all. For example, due to a lack of precise data collection at schools it might be impossible to track student attendance over time.

Second, the assessed costs of the evaluation should be considered in relation to the expected benefits. What can the PPP (or individual partners) learn from the evaluation? And will these results be implemented (by the PPP itself or by another organization)? If the answers to such questions are unfavourable, evaluating the impact might be a waste of resources. For example, if the PPP implementing the breakfast feeding programme is fully dependent on specific funding streams for this programme, it might not be willing to consider changing into another activity if the results of the evaluation would be disappointing.

The ability to conduct a rigorous impact evaluation thus depends on the collection and analysis of accurate impact data. This accuracy in turn depends on the methodologies that are used to design the evaluation and collect and analyse the data.

III. Conclusion

The impact of PPPs is usually viewed as purposive behaviour. Measuring the positive or negative impact on society of the actions of these PPPs is arguably one of the most, if not the most, important topics to be studied in management literature on PPPs. Although practitioners as well as researchers have argued for increased attention for the social impact of PPPs (Kolk, 2014; Sciulli, 2008), similar to other academic disciplines less emphasis has been put on the methods to measure that impact, and the role of the respective rigor of those methods (Salazar, et al., 2012; Tobias, et al., 2013; Wood, 2010).

This study aims to further stimulate the shift in research and practice from a focus on the static potential of partnerships to better society (e.g., can PPPs combat malnutrition and hidden hunger?), to the impact of the actions of these PPPs by actively measuring and managing them (e.g., how can the impact of our partnership programs be improved?).

To facilitate this focus on impact, actions and measurement, we will provide an overview of the interdisciplinary literature on impact measurement, and the steps of the measurement process of assessing or evaluating social impact will be

laid out. The aim of measuring social impact is not only to evaluate the effectiveness of PPP actions, but mostly to be able to improve this impact. The results from rigorous impact evaluations can be used to optimize PPP actions and make more accurate future assessments of such actions. Thereby, impact evaluations are the starting point of improving the impact of PPPs on society.

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Business Model Assessment – Taking a Stakeholder Perspective

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Abstract: The present paper approaches the sustainability effects of a business model from a stakeholder perspective. Acknowledging that value creation takes place within the relationship between the company and its stakeholders, we develop a framework to assess the sustainability effects of a business model. In this framework we connect the business model concept with an acknowledged tool for sustainability performance management, thus enabling researchers and practitioners to assess their business models and to draw conclusions for sustainability management.

I. Introduction

Business models specifically aimed at generating positive outcomes for their stakeholders in all three spheres of sustainability can be defined as “sustainability-oriented”^[1]. These business models create business cases for sustainability and thus realise economic success through voluntary environmental and social activities^[2]. They create value for a diverse range of stakeholders, including customers, partners, employees and more.

However, reviews of business model concepts reveal that firstly, the large majority of them do not explicitly consider sustainability^{[3], [4]} and secondly, that they emphasise the relationship between the business and only two groups of stakeholders: the customers and the investors^[5]. In recent years, various approaches for integrating sustainability into business models have been proposed^{[1], [6]}. These introduce the question of how business models can generate positive environmental and social outcomes, in addition to financial results^{[7],[9]}. They do not, however, investigate which stakeholders benefit from these additional outcomes. Another approach, taken by Bocken et al.^[10], offers a qualitative mapping tool that supports the visualisation of different types of value created for a variety of stakeholder groups. This allows linking different types of (positive and negative) sustainability outcomes to relevant stakeholder groups.

A framework that allows assessing the extent of the sustainability outcomes of a business model, however, has so far not been designed. This paper aims at filling this research gap by developing a framework for assessing the sustainability outcomes of business models, which not only maps created value to stakeholders, but also provides quantitative and qualitative information that can be fed back into performance management processes.

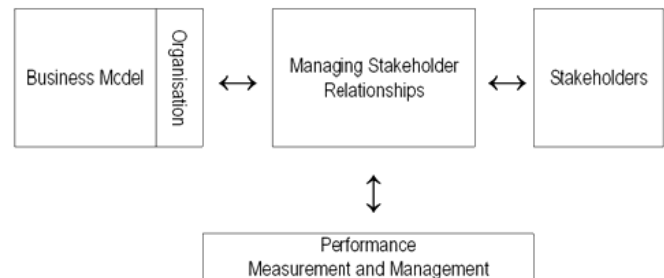


FIGURE 1: LINKS BETWEEN THE BUILDING BLOCKS OF THE ASSESSMENT FRAMEWORK

As outlined in Figure 1, we first take a closer look at the links between the business model design and at the relationships between the organisation and its stakeholders. Subsequently, we employ a performance management tool that is conducive to the structure of the business model concept, as a way of making measurements available for use in management decisions.

II. Stakeholder relationships and value creation

Both conventional and sustainability-oriented literature suggest that a business model creates value for stakeholders of the company – ideally for all its stakeholders^{[11],[14]}. According to the stakeholder view, the value creation process takes place within the relationships between the business and its stakeholders^[15]. In a mutually beneficial relationship, value is being created for the company by the stakeholders – as well as for the stakeholders by the company^[16]. In assessing a business model’s sustainability outcomes, both of these streams of created value should be taken into account. The next section discusses the structure of a business model concept that includes stakeholder relationships and the value created therein.

III. Business model design from a stakeholder perspective

Our representation of a business model discusses five interrelated rationales or logics from a sustainability perspective: the financial logic, the customer market logic, the production logic, the capabilities and resources logic and the contextual logic. The logics in this business model concept each address a different domain of activity: the revenue model and the costs configuration, for instance,

pertain to the financial logic. The customer market logic comprises the value proposition and the customer interface, whereas business processes including innovation, production and logistics are parts of the production logic. Aspects relating to capabilities, competencies and knowledge are integrated into the capabilities logic. Last, but not least, the contextual logic frames the other four components by dealing with corporate reputation, politics, environmental and social issues, as well as legitimacy. It differs from the other four logics in so far as it explicitly considers extra-market issues and thus allows considering the value created within relationships with societal stakeholders^[17].

Decisions and activities within an organisation are generally allocated to an individual or group of people fulfilling a particular function, e.g. a working group or department. Therefore, one can argue that each business model logic relates to a certain business function. As shown in Figure 2 below, we distinguish between five generic groups of stakeholders (financial stakeholders, customers, suppliers, employees and societal stakeholders), each of which primarily interacts with one business function.

This does not exclude the possibility that other relationships exist as well, but acknowledges the main assigned stakeholder relationships. Value is being created in the interaction between each function and the respective stakeholder group. Thus, the financial logic describes how the organisation, through its finance function, interacts with its financial stakeholders (owners, creditors, etc.) to generate value for these stakeholders and from these stakeholders.

Similarly, the marketing logic describes how an organisation, through its marketing function, manages its relationships with customers and creates value as part of the interaction. Through its marketing function, the organisation offers solutions, products and services, which are of value to the customer. In turn, the customers accept the offer and the organisation receives value in form of sales.

The production logic comprises the relationship between the organisation (through its production function) and its partners (suppliers, logistics partners, etc.). The capabilities and resources logic shows how the organisation, through its organisational development function, relates to its employees (middle managers, workers, etc.). The contextual logic describes how the organisation, through its environmental, social and legal function, creates value with its societal stakeholders (government, media, NGOs, etc.).

This structured representation of business models lays the foundation for collating and structuring measurements with the help of a performance management tool in the next step.

IV. Measuring sustainability performance

In order to measure sustainability outcomes, the value that is being created for each of the five stakeholder groups needs to be described and assessed. This information can then be fed into a performance management system, where it supports management decisions. As part of the framework presented in Figure 2, we propose implementing a performance management tool called “sustainability balanced scorecard” (SBSC), which facilitates integrated sustainability management^[18] and adheres to a similar structure as our business model concept.

The SBSC builds on the original balanced scorecard as developed by Kaplan and Norton^[19]. The balanced scorecard suggests developing and organising performance measures in four perspectives (financial, customer, internal and learning and growth). In addition to the four perspectives of the conventional balanced scorecard, the SBSC in its non-market perspective also takes into account strategically relevant environmental and social issues that influence the business from outside the market system^[18]. Within its five perspectives, the SBSC can hold different types of information, whether they are monetary values, physical measurements or qualitative conclusions. This enables structuring of measurements of created value which can be monetary but may also be social, e.g. secure jobs, or environmental, e.g. provision of products supporting low carbon lifestyles.

In the assessment framework outlined in Figure 2, the measured financial value can be examined in the SBSC's financial perspective; the customer market value in the customer perspective; the production value in the (internal) processes perspective; the employee value created in the capabilities and resources logic in the learning and growth perspective; and, finally, the societal value created in the contextual logic in the non-market perspective.

Within the SBSC, the created value measurements are compared to targets, which could be internal key performance indicators (derived from the strategy) or externally prescribed standards (e.g. environmental standards). Depending on how the outcomes relate to the targets, changes may have to be implemented through the performance management system to adjust the value creation processes accordingly.

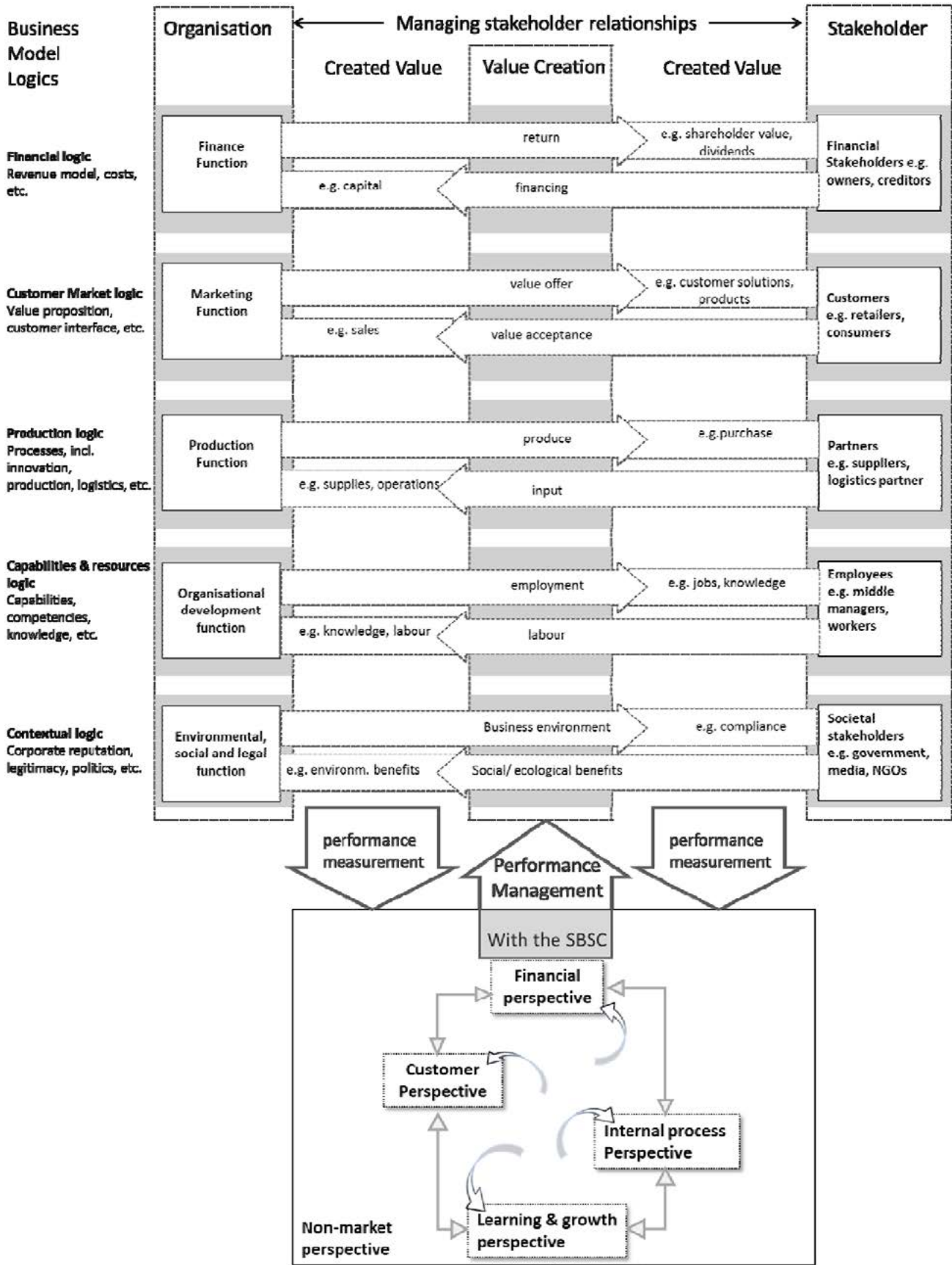


FIGURE 2: LINKS BETWEEN THE BUSINESS MODEL CONCEPT, ORGANISATIONAL FUNCTIONS, THE COMPANY'S STAKEHOLDERS, RELATIONSHIPS, AND MEASUREMENT WITH THE SBSC

V. Discussion and conclusion

Our proposed assessment framework builds on extant qualitative literature [e.g. 10] and extends the existing approaches by offering a structure to conduct sustainability performance assessment and management for business models.

In this context, the contribution of our research is threefold. First, looking at business models from a stakeholder perspective offers new possibilities to structure information regarding value creation. Second, business model concepts themselves can be used as tools for analysis ^[20], ^[21]. By enabling an assessment of business models, we provide a foundation for further use of business models as analytical devices. Last but not least, we connect a novel business model concept and an established assessment tool (SBSC), thus linking so far independently proposed management and measurement approaches for real-life implementation of the framework.

Each business model logic has its specific value creation processes and therefore results in specific sustainability effects. Separating these effects in performance measurement and management provides a clear structure and enables targeted communication with each stakeholder group regarding the sustainability aspects of the business model logic that they are involved in. The SBSC with its key performance indicators and measures in separate perspectives supports both management and transparency within each logic.

Applying the framework aids managers and practitioners in improving performance, as well as in evaluating and comparing the sustainability effects of their business models.

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Carbon performance measurement and reporting in global logistics industry: Challenges and Collaboration opportunities between corporations and academics

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Abstract: Corporate carbon emission measurement and reporting has been increasingly adopted within the global logistics industry in the last twenty years. However, companies within the global logistics industry do not follow the same carbon measurement and reporting approaches. This short paper explores the similarities and differences of carbon performance measurement and reporting in the global logistics industry based on the three cases of the global players, FedEx, UPS, and DHL. More importantly, these cases serve as a foundation to address the collaboration opportunities between business practitioners in corporations and academic knowledge.

I. Introduction

Corporate carbon emission measurement and reporting has been increasingly adopted within the global logistics industry in the last twenty years^[1]. This increasing interest in carbon emission measurement and reporting is driven by the growing economic and business relevance due to regulatory, societal and market influences^[2]. However, companies within the global logistics industry do not follow the same carbon measurement and reporting approaches^[3]. Although there is a growing body of research in the fields of sustainability performance measurement, in particular carbon emission performance measurement, there is no 'one size fits all' approach.

In the identification, measurement and reporting of carbon performance for global logistics industry, sustainability accounting can provide an avenue for addressing environmental and economic activities. As Lee and Wu^[18] point out, 'measuring sustainability performance, especially carbon performance is a challenging task for corporate accountants and managers (p.362)'. In corporate practice, carbon performance issues are often neglected or partially addressed, and not fully integrated with information and management systems^[15],^[17]. Despite the importance of integrating carbon performance in global logistics activities, there is a lack of available approaches and tools to measure and report carbon performance in the global logistics sector.

This short paper aims to address key challenges of carbon performance measurement and reporting in global logistics industry, and to explore three cases of global players, FedEx, UPS, and DHL to demonstrate current practice of carbon performance measurement and reporting. More importantly, this paper addresses the collaboration opportunities between corporations and academics to investigate (i) key roles of corporate managers in different departments and corporate accountants in carbon performance measurement and reporting; (ii) carbon emissions boundary setting and measurement approaches in the sector; (iii) the usefulness and important value of sustainability accounting for carbon performance measurement and reporting in the sector.

II. Carbon performance measurement and reporting: three case studies in global logistics industry

According to the World Economic Forum, the logistics industry accounts for around 5.5% of global carbon emissions^[4]. Global logistics companies, as facilitators of global trade, can thus be regarded as a significant source of carbon emissions. This study uses three leading global logistics companies, the so-called 'integrators', namely Federal Express (FedEx), DHL Express (DHL) and United Parcel Service (UPS) to examine similarities and differences between carbon measurement and reporting approaches. All three companies are fully integrated across the four main transport modes (air, rail, road, and ocean)^[5]. In addition, all three companies are dominant players in the express business service being able to service the majority of the world within 48 hours^[6],^[7],^[8]. The resources and systems of all three exemplars are extensive in terminals, means of transportation, handling equipment, etc. To a large extent, the global network is based on air transport mainly using their own aircraft, which ensures high quality and speed, i.e., time is an extremely important factor^[16]. The extensive use of the network with the heavy dependence on fossil fuels results in heavy carbon emission output and leads to pressure to disclose carbon emissions^[3].

Vanguard Future Fit 500 - Redefining Corporate Value for the Century of Growth

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There are many corporate rankings aiming to include sustainability aspects next to conventional financial performance data in order to influence investor and business decision, resp. to inform the public opinion. However they all have a few shortcomings in common, which the Future Fit 500 framework aims to overcome by delivering a new comprehensive ranking that provides companies an objective platform to showcase their positive environmental, social, human and future impact instead of just penalising them for negative externalities. This paper introduces some key thoughts around the framework, created by future-fit leaders of the initiative 'The Leadership Vanguard'.

I. Introduction

The starting point of Future Fit 500 roots with the global initiative 'The Leadership Vanguard'. This collaborative program seeks to identify, support and mobilise future-fit leaders - all in the interest of reinventing growth for a more inclusive and sustainable growth model. Inspired by discussions between CEOs such as Paul Polman and Ben van Beurden, and instigated by Xyntéo and DNV GL, the Vanguard partnership includes Unilever, MasterCard, Woodside and Singapore's Economic Development Board. It is a growth initiative focused on collaboration across silos and networking beyond borders, both geographical and industrial. Within the overall initiative the topic of 'redefining value' has been identified as a key work stream, since it appears mandatory to develop an alternative set of success criteria for companies and society that go beyond pure gross revenue and can therefore lead to a more sustainable growth agenda. During a close collaboration of future-fit leaders from above companies, the idea of a new holistic corporate ranking approach was born. This new approach is planned to leverage influence on policy makers defining the ultimate accounting standards of the future and on companies starting to change behaviour even before legislation or market and financial developments force them to do so. Whilst there are many corporate rankings out there trying to attract the attention of investors and business leaders as well as many initiatives that aim to include sustainability aspects into the corporate ranking world, they all have a few shortcomings in common. Firstly, it is difficult to win participants and only the most reputable ones manage to attract top league companies. This is due to the lack of immediate business benefit for participating companies.

Even more, it can create a potential risk, since most sustainability rankings only measure negative externalities.

Secondly most sustainability rankings solely focused on the impact on natural stocks and do not create a holistic view that includes impact on social and human capital as well and/or include forward looking elements (e.g. via technology disruptors).

Thirdly, the public awareness for many of these initiatives is frighteningly low. There is a huge gap between quality of content (in some) and the communication power needed to influence policy makers or company behaviour. Consequently, businesses around the world are still making decisions based on traditional measurements, manifested in traditional P&Ls that are preventing a real step change in terms of sustainable growth and the innovation in products, business models and leadership styles that are needed to get there.

II. Idea

The Future Fit 500 will influence decision makers – quickly and efficiently - by creating a holistic future appropriate valuation framework that helps companies, investors and other stakeholders make better decisions. The framework will include – as enhancement and additional to a traditional financial evaluation – positive and negative impacts in 3 basic pillars: NATURAL CAPITAL, SOCIAL & HUMAN CAPITAL and FUTURE CAPITAL.



FIGURE 1: FUTURE FIT 500 FRONT PAGE LAYOUT

While the latter (mainly being manifested in disruptive innovation and technology) could be seen as an enabler for the other two, it has been included on purpose as a forward looking element to give visibility to and correctly value those companies that come up with the game changers that will shape the future. Using an electric car is one (good) thing, inventing it is another (even better) thing. To enable comparability across sectors and industries and hence be an effective ranking alternative, the model aims to identify key corporate drivers per pillar that are known to create significant 3rd party impact. Those key drivers will allow to identify externalities, which again can be measured as value gain or loss perceived by 3rd party. This approach ensures a globally relevant evaluation against the background of different values and norms.

III. Methodology & model

The key aim of this initiative is creating a framework that is logical, appealing and solid enough to attract the attention of corporate stakeholders and drive accelerated change through public awareness (simplicity and PR-ability are key next to soundness of the model). In order to arrive there significant research has been conducted over the past 6 months including the review of academic and non-academic literature, existing corporate rankings and investor information. Further expert interviews were completed with partners across the field of sustainability measurement and rating. The initiative and idea has passed several reviewing milestones of the board and sponsorship of the Vanguard Leadership initiative with encouraging feedback to move forward. In the next phase of the overall Vanguard programme the idea is planned to move into a most viable product status, to be presented at a summit in New York in Nov 2015. Therefore, the model will be tested and verified against the expertise of further academic, public and corporate stakeholders, which is planned to translate into actual partnership for implementation and realisation. Consequently, case studies and sample evaluations will be kicked off to validate the model further and to leverage awareness level and global rollout.

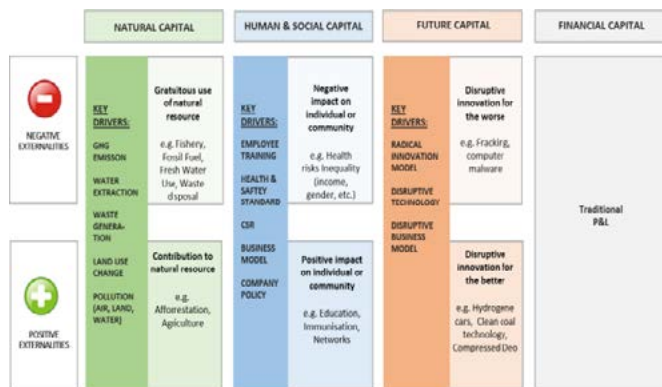


FIGURE 2: FUTURE FIT FRAMEWORK MODEL

Whilst externalities are often not exclusive to any pillar dimension (but ambiguous) the framework takes a choice on its primary impact. Following mandatories for the model have been identified from the diverse expert interviews and literature research.

- It needs to include both positive and negative impacts and go beyond the usual internalization of impact on nature
- It should be driven via partnering and co-developed with existing players - not as a competitive model
- It should aim for a multiplication of impact through principle of leveraged influencing
- It should be based on an open source system to create transparency and enable evolvement through community
- It should build as much as possible on existing frameworks aiming to combine and enhance where necessary

Aim is to start with partner framework, logic and a small sample, rather than a comprehensive list of companies. The purpose is provide an unbiased look at future fitness criteria and not serve the interest of Vanguard companies

IV. Conclusion

Given its open-source and collaborative nature the Future Fit 500 is a non-competitive, but aggregative framework that generally will benefit from discussion and expert input. Particularly at the current stage of the initiative with a model being reworked for road testing it is mandatory to seek academic and practitioner feedback in order to fine-tune and optimise before implementation and realisation. Key areas that the authors are working on: solid measurement of the future dimension (as well as the other pillars) value propositions and reason to success for market deployment as well as partnerships for realisation.

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Measuring and Maturing the Sustainability Performance of Companies

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Abstract: In the emerging agenda of integrated policies for innovation and sustainable development, measuring and building capabilities for sustainability integration into product development play a determinant role. This paper presents a consolidated and proven approach to support companies in measuring and maturing their sustainability performance.

I. Introduction

Sustainability has become a key competitive factor for industry worldwide. Sustainability incorporation into business processes is essential to boost marketing opportunities, comply with legislation and fulfil customers' needs, ensuring long-term success and competitive forefront [1–3].

Product development is a core business process for sustainability integration into manufacturing companies: ca. 90% of the environmental, economic and social impacts across a product life cycle [4,5] (from raw material extraction and manufacturing to use and end-of- life) are determined in the initial phases of product development [6,7].

Nevertheless, companies still face various managerial, organizational and technical challenges for an effective, consistent and successful implementation of sustainability into product development [10–13].

II. How can we support companies to measure and mature their abilities to sustain?

This article introduces a managerial framework developed in academy over the last 10 years in close collaboration with industry to support the management of sustainability integration into product development and related processes [14–16].

The EcoM2 (Eco Maturity Model) is composed by a comprehensive body of knowledge of more than 700 best practices, organized in five maturity levels [17] that represent successive stages for incorporating sustainability into business processes [14].

By enabling the measurement of companies' current maturity profile and providing guidance on the best path for implementation, the EcoM2 supports companies on a systematic and consistent management of sustainability integration into the product development and related processes (such as marketing, purchasing and manufacturing).

The EcoM2 focuses on process improvement (product development and related processes) from a managerial perspective. In other words, it focuses on the systematic and sustained integration of sustainability into the processes of a product development organization, with a view to deployment in all development projects.

When the best practices for sustainability integration are properly considered during the product development and related processes, the natural consequence is the development of products with enhanced sustainability performance.

III. How does the maturity model work?

The EcoM2 provides a structured framework for the implementation and management of sustainability into product development, based on six main steps (figure 1) [18].

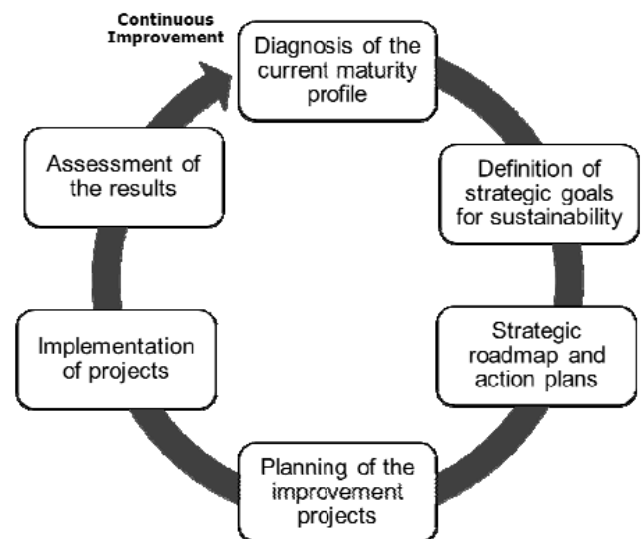


FIGURE 1: CONTINUOUS IMPROVEMENT FRAMEWORK FOR INCREASING SUSTAINABILITY MATURITY

It starts with a diagnosis (or measurement) of the current maturity profile (“as-is”) and definition of strategic goals for implementation (“to-be”). Based on the gap between the “to-be” and “as-is” maturity profiles, strategic roadmaps and actions plans are deployed based on the EcoM2 body of knowledge.

Subsequently, the projects are planned and implemented with special consideration of Change Management best practices. The results of each project are continually evaluated throughout the improvement cycle. A given improvement cycle is finalized by a new diagnosis that will evidence the achievements and allow the identification of further projects to be implemented towards higher maturity profiles.

IV. How do we measure the current maturity profile?

The first step when applying the EcoM2 is the diagnosis of the current maturity profile of a company’s product development and related processes in regards to sustainability implementation^[14].

During the diagnosis, we measure the sustainability performance of product development companies based on five capability levels (from incomplete and ad hoc, to formalized, controlled and optimized implementation) that indicate how well each one of the EcoM2 best practices is being applied.

The diagnosis is performed in three main steps: (1) in-depth documental analysis, (2) face-to-face interviews with stakeholders from different hierarchical levels and functions and (3) consolidation of the results with quantitative data analysis.

The results of the diagnosis are consolidated in the maturity profile of the company, represented in the maturity radar (figure 2).

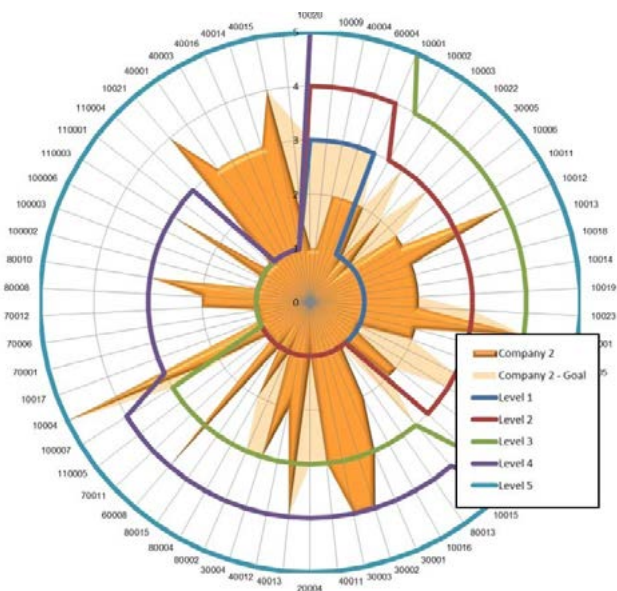


FIGURE 2: EXAMPLE OF A MATURITY PROFILE OF A COMPANY (INCLUDING THE “AS-IS”, THE “TO-BE” AND STANDARD MATURITY LEVELS) – THE MATURITY PROFILE MEASURES THE INTEGRATION OF SUSTAINABILITY INTO PRODUCT DEVELOPMENT AND RELATED PROCESSES

The radar is an effective tool to communicate the company’s performance on sustainability integration into product development, since it provides a clear and visual representation of the current maturity profile, showing strengths and improvement opportunities in relation to the standard maturity levels and the companies’ strategic drivers.

V. Which are the benefits for companies?

Currently, the EcoM2 is being successfully applied into several large multinational manufacturing companies in South America and Europe.

The companies’ types vary from business-to-consumer (B2C) to business-to-business (B2B), with sectors ranging from aerospace to toys and cosmetics. All the companies involved with the EcoM2 application are currently implementing the defined roadmaps, being in different stages of the improvement cycle defined by the application method.

The EcoM2 has proven to support companies with different characteristics and maturity stages towards a systematic and consistent integration of sustainability into product development and related processes. Based on the application of the EcoM2 in those companies, the following direct benefits could be identified:

- Systematic way for measuring and enhancing sustainability maturity in product development, aligned to the long-term strategies and goals;
- Consistent and reliable evaluation of strengths and improvement opportunities, based on the diagnosis of the current maturity profile (“as-is” situation);
- Comprehensive benchmarking of best practices and cross-companies profiles, indicating the relative position of the company in its market;
- Strong basis for setting strategic goals towards sustainability integration into product development, which allows the deployment of strategic roadmaps (“to-be” situation);
- Common language and a shared vision in the organization, supporting communication and awareness raising in addition to top-management commitment;
- Continuous improvement framework that supports companies towards higher maturity profiles on sustainability integration into product development.

In other words, the EcoM2 supports managers in the measurement of their maturity for sustainability integration into product development and on the deployment of strategic and tactical action plans for an effective and successful implementation, according to their strategic drivers and goals.

Further developments of the EcoM2 includes: (1) establishment of a recognition scheme to companies based on their current maturity profile, which will allow a direct communication to the main stakeholders and increased competitive advantages; and (2) development of a framework to calculate the business case for sustainability integration into the product development and related processes to enhance the analytical power of decision-making in sustainability implementation.

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Measuring the Performance of Smart Cities in Europe

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Abstract: This conference abstract summarizes the approach and first outcomes of the CITYkeys project funded by the EC under the H2020 Programme. The goal of the project is to provide a validated, holistic performance measurement framework for monitoring and comparing the implementation of Smart City solutions, inside and beyond Horizon 2020. The framework is being developed in a bottom up-process based on the needs of several partner cities.¹

I. Introduction

Urban sustainability is currently closely related to the concept of a Smart City, an idea heavily supported by the European Commission and the European Innovation Partnership on Smart Cities and Communities (EIP SCC)^[1]. The European Commission has developed two parallel approaches to support European Cities in becoming smart: Large scale demonstration of technology in cities and communities ('lighthouse projects') and 'horizontal activities' to address specific challenges as, for example, in regulatory barriers, in standardisation, public procurement and performance monitoring^[2].

The results presented in this paper are first outcomes of the CITYkeys project^[3] funded by the EC under the H2020 Programme. It is part of the above mentioned 'horizontal activities'. The goal is to provide a validated, holistic performance measurement framework for monitoring and comparing the implementation of Smart City solutions, inside and beyond Horizon 2020. CITYkeys focuses on developing and validating performance indicators and data collection procedures in a bottom-up process with five partner cities: Vienna, Rotterdam, Tampere, Zagreb and Zaragoza. The resulting processes and procedures shall be used for the common and transparent monitoring of Smart City projects (initiatives/actions) and solutions across European cities once the project is completed.

II. Methodology

The ambition of CITYkeys is to develop an indicator framework in a bottom-up process, based on the needs of cities. To achieve this ambition, the project team started by analysing the cities' and their stakeholders' needs regarding a performance measurement system.

To identify the needs of cities on the measurement of smart city performance, two surveys were distributed to the partner cities (Tampere, Rotterdam, Vienna, Zagreb and Zaragoza) and to other members of the EUROcities network, a large European city network. The survey "Cities' needs" covered topics such as Smart City and Smart City project definitions, Smart City and Smart City project performance measurement, measurement tool properties, data collection and open data, whereas the survey "Citizens' and stakeholders' needs" focuses mainly on Smart City project evaluation and acceptance of open data. In addition, several in-take workshops were held in the partner cities to gain better understanding of specific key topics by a qualitative approach. The key topics included questions regarding the potential target groups of a performance measurement framework and use cases for a performance measurement system, to provide two examples.

Besides from elaborating the cities' and stakeholders' needs, existing frameworks for assessment and (open) data exchange, of other relevant developments e.g. research projects, data protocols etc. and KPIs are assessed. To create an inventory of existing frameworks, an extensive survey of existing KPI systems for project evaluation is carried out. The inventory covers relevant FP7 and HORIZON 2020 projects as well as national and international KPI frameworks. In order to map the KPIs efficiently, the KPIs are classified based on the themes "People", "Planet", "Prosperity".

Finally, the results of the surveys and the in-take workshops are merged with the results of the mapping of the KPIs. To fulfil this task four workshops are organised, in which practitioners as well as researchers participate. The workshops aim to narrow down the number of KPIs from existing frameworks, based on several criteria, such as relevance, availability, measurability and reliability in order to establish the final set of KPIs. The results are regularly adjusted with the findings from the investigation of the cities' and stakeholders' needs to ensure the needs of the practitioners.

III. Results & discussion

In total, 19 cities from all over Europe submitted completed questionnaires and/or offered additional input regarding their needs and expectation towards a performance measurement framework. The survey on "cities' needs" showed, that approximately 50% of the cities do not measure their smart city performance, although almost 75% consider the topic "Smart City" of high importance. The top five themes, that cities would like to measure with a Smart City performance measurement systems on city level are "Energy", "GHG emissions", "Transportation", "Digital infrastructure and services", "Resource management" and "Citizens participation". On project level the top five themes are "GHG emissions", "Energy", "Transportation", "Digital Infrastructure and services", "Environment (air quality, noise, soil, green areas,...)" and "Quality of Life". On the contrary, the citizens and stakeholders consider "Creation of innovation and knowledge", "Better public transportation", "Protection of the environment", "Better education and skills building" and "Clean Energy" as the five most important outcomes of Smart City projects.

The surveys demonstrated that there is a high need for Smart City KPIs. Many cities consider the topic Smart City as highly relevant, but do not have appropriate measurement systems in place. Moreover the analysis showed, that the topics "Energy", "Transportation" and "Environment"/"Resource management" are considered relevant by cities as well as by stakeholders and citizens, on city and on project level. Topics such as "Digital Infrastructure and services", "Citizens Participation" and "Quality of life" are ranked higher by cities than by citizens and stakeholders, whereas "Creation of innovation and knowledge" and "Better education and skills building" seem to be higher concerns for citizens and stakeholders than for cities. However, the amount of completed questionnaires is considered to be too low to derive representative results. Nonetheless, they provide a first overview of the cities' and stakeholders' needs. To improve the results a second round of questionnaires is considered at a later stage of the CITYKEYS project.

The mapping of the indicators shows that there are numerous indicators available. However, it is crucial to identify the appropriate KPIs for the purpose of CITYKEYS. This selection can only be performed in close collaboration between practitioners and researchers. The great variety of indicators and the broad range of topics accompanying the Smart City discussion provide a challenge in prioritizing the indicators and KPIs.

IV. Next steps

The CITYKEYS framework will be tested in the 5 partner cities: Tampere, Rotterdam, Vienna, Zagreb and Zaragoza. The cities will be involved in defining the stakeholders' needs and the performance system requirements (including usability requirements), in evaluating and testing the system prototype and in building recommendations for its implementation in planning and municipal decision-making processes. CITYKEYS performance measurement framework will include specific Smart City KPIs that go beyond the traditional division into categories and will measure the integration and innovation level of the smart solutions. The implementation of a common performance measurement framework based on a set of relevant indicators, open data applications and decision-support user-interfaces enables stakeholders to learn from each other, create trust in solutions, and monitor progress. This will allow cities to move towards a sustainable transformation while spending less public resources and improving services offered to its citizens

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FIGURE 1: PRIORITY AREAS OF EUROPEAN INNOVATION PARTNERSHIP ON SMART CITIES AND COMMUNITIES [4]

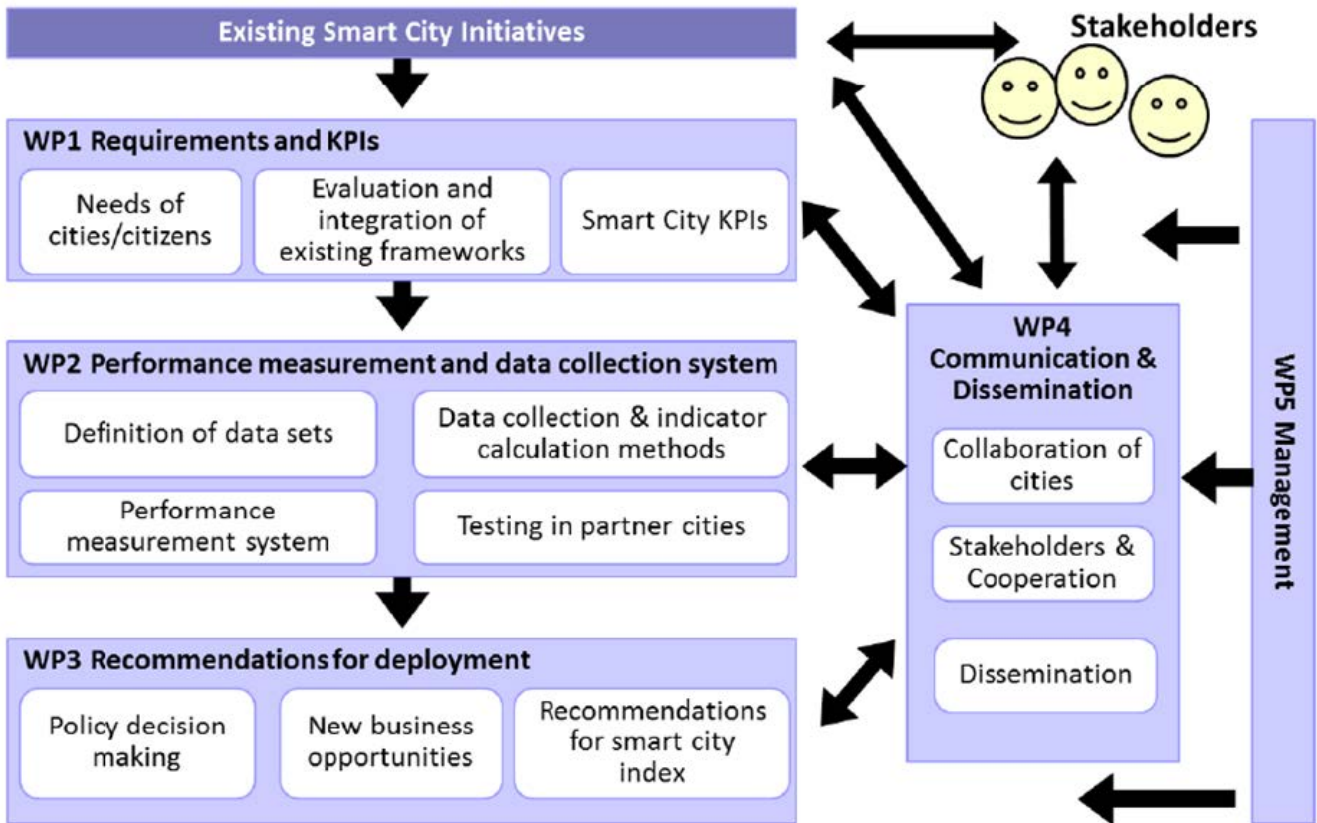


FIGURE 2: WORK PLAN OF THE CITYKEYS PROJECT

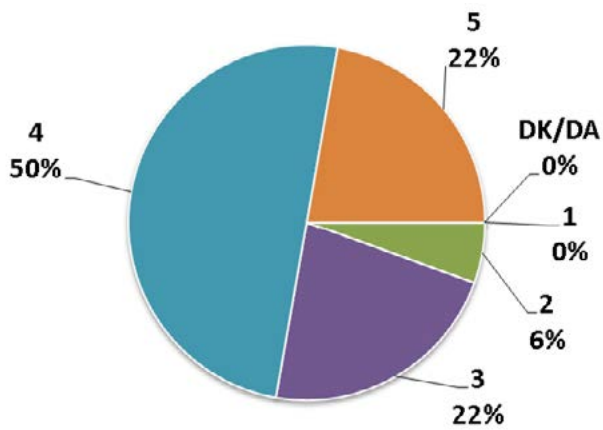


FIGURE 3: HOW HIGH IS THE TOPIC OF "SMART CITY" IN YOUR CITY'S AGENDA?

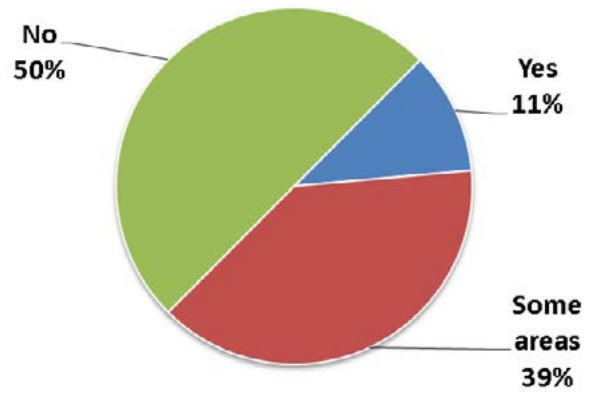


FIGURE 4: DOES YOUR CITY MEASURE ITS SMART CITY PERFORMANCE?

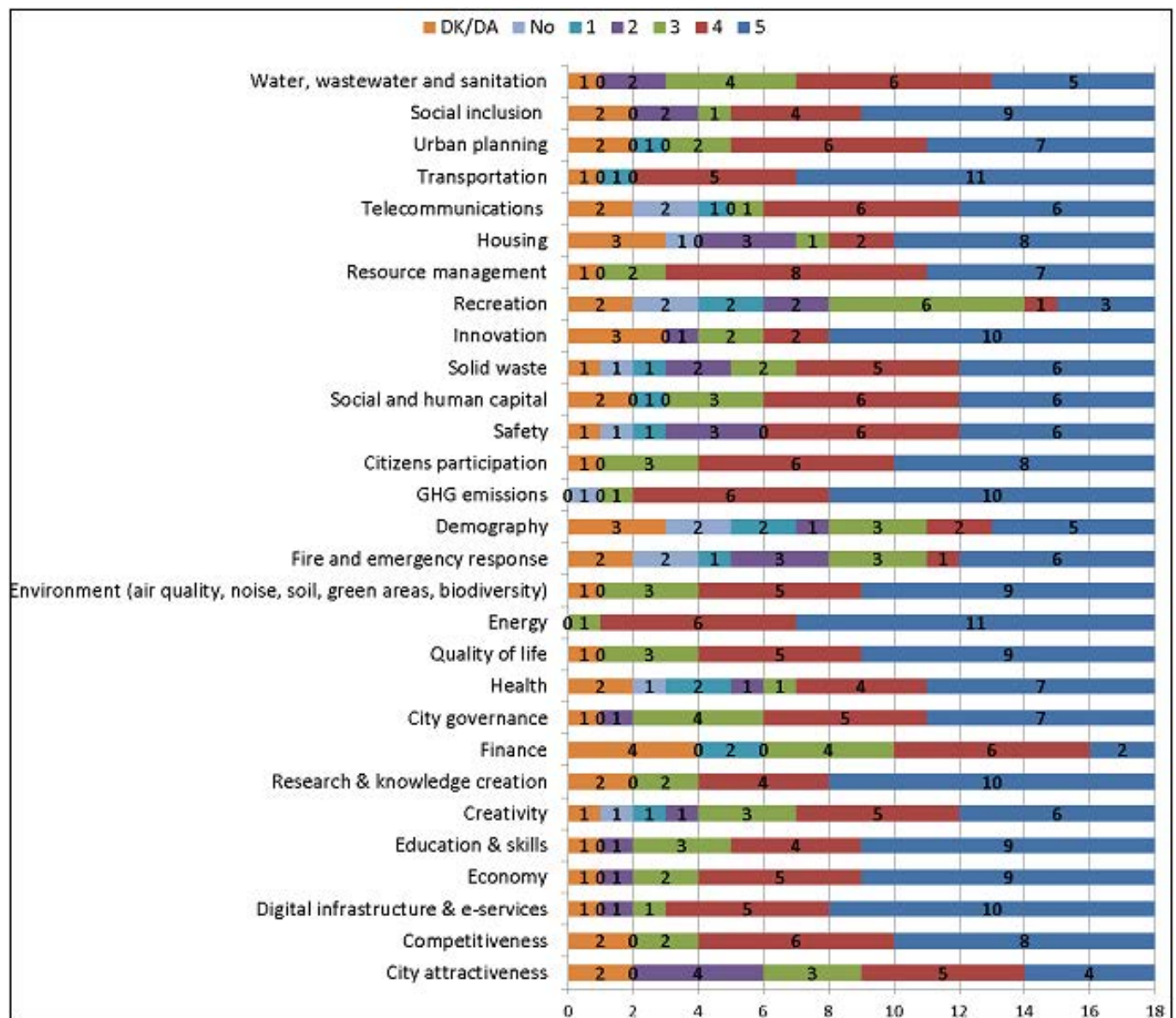


FIGURE 5: AREAS WHERE CITIES NEED INDICATORS TO MEASURE THEIR SMART CITY PERFORMANCE

A survey of sustainability management control practices: evidence from Brazilian finance executives

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Abstract: The objective of this study is to map and analyse the integration of sustainability into management accounting practices of sustainability reporting companies in Brazil, and the participation of finance executives in sustainability controlling and reporting processes. The results provide evidence of some internalization of sustainability into management accounting practices, triggered by sustainability reporting. The findings also show the executives increasingly involved in sustainability disclosure and control. They seem willing to take on more responsibilities; however, there is a call for more specialized education.

Keywords: Sustainability management and accounting, management control systems, survey, finance executives, sustainability education.

Although the number of companies disclosing corporate social responsibility information has increased, there is criticism about the quality of the disclosures ^[1], ^[2]; low integration of social and environmental issues into management decisions ^[3], ^[4]; and not institutionalization enough to change corporate culture ^[5], ^[6]. There have been calls for management accounting studies in emerging fields like sustainability ^[6], ^[7]; and more engagement with companies to implement sustainability accounting and management control (MC) systems for sustainability ^[8], ^[9], ^[10].

The objective of this research is to map and analyse the integration of sustainability into management accounting practices of reporting companies and the participation of accounting professionals in sustainability controlling and reporting processes. Sustainability is represented by the economic, environmental and social dimensions of the triple bottom line approach. The incorporation of sustainability was investigated in traditional management accounting artifacts with the support of the 'levers of control' MC model, which comprises belief systems, boundary systems, as well as interactive and diagnostic control systems ^[11]. Regarding the investigation of specialized sustainability controls, techniques and indicators were selected drawing on previous surveys, social and environmental accounting literature and the Global Reporting Initiative (GRI) guidelines ^[12], ^[13], ^[14], ^[15], ^[16].

A survey was carried out to collect data on the possible embeddedness of the sustainability subject into the companies' MC systems, that is, to test the presence of social and environmental topics, as well as a broad focus on stakeholders in their management accounting artifacts. A sample of fifty-nine companies responded to the survey, representing 34% of the population of companies that

disclosed sustainability reports in Brazil in the period studied. Questionnaires were made available online to accounting and finance senior executives. The respondents' jobs ranged from general accountant to vice

president, who could be assisted by the sustainability experts of their companies at their convenience. The questions are divided into four blocks: 1) sustainability reporting and external disclosures; 2) sustainability measuring and controlling; Open-ended questions and space for the respondents manifest freely complements the questionnaire.

This study examined legitimacy and institutional theory assumptions, such as i) sustainability reports represent companies' strategic responses to society's demands to ensure legitimacy ^[17] and to show conformity ^[18], ^[19] with sustainability precepts; ii) companies deal with sustainability in a ceremonial way, so their MC practices are decoupled or loosely coupled to sustainability ^[18].

The data was analyzed using descriptive and structural equation modeling (SEM) statistical techniques, as well as qualitative text analysis. SEM has been appointed in the literature as an adequate statistical technique for management accounting research to provide simultaneous tests of measurement reliability and structural relations, as well as to overcome some of the usual limitations of the research such as small sample size ^[20].

The research results suggest that the disclosure of sustainability reports positively impacts the MC practices. Triggered by sustainability reports disclosure, there is evidence of the internalization of sustainability into the ambit of management accounting, especially regarding the presence of sustainability in control artifacts, but not necessarily to the extent of their use. Sustainability was more easily found in 'soft' MC artifacts, such as mission statements and policies linked to belief systems, whereas more rarely in diagnostic systems like budgets or project evaluation requirements. It reinforces the calls for the integration of sustainability into internal systems, but also highlights the complexity of the incorporation of the sustainability concept into ordinary business tasks.

The findings also show that accountants and financial executives are increasingly involved in sustainability disclosure and control, mostly in external reporting with lower involvement in control activities and they seem willing to take on more responsibilities. Nevertheless, in the open-ended

questions section of the research, the respondents indicated a need for education to expand their role in corporate sustainability themes. They signal that specific education is required to cope with the challenges of sustainability. They call for more education and training on sustainability management accounting and expertise on how to incorporate sustainability into management accounting tools and techniques.

Conclusion

Although education is long recognised as “the most vital of all resources”^[21], the academia still needs to enhance its role when it comes to sustainability management and accounting. “Given the complexity of sustainability, there is a crucial role for education.”^[10]. We need to provide the opportunities for finance executives and management accountants to develop skills to engage more actively in the complex debates on sustainability and the practical tasks of incorporating sustainability into management accounting tools and techniques.

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Challenges of integrating site- and product-specific environmental information – observations at a food producing company

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Abstract: This paper presents results and experiences of developing and implementing a company-wide environmental information system at a large Thailand-based food company. It links the findings to former research in the field and highlights the challenges that occurred during pilot implementation, in particular the importance of ensuring data quality.

I. Background

Charoen Pokphand Foods PLC (hereafter CPF), a large Thai-based food producing company, commissioned the Institute for Industrial Ecology at Pforzheim University to support the conceptualization and pilot implementation of a corporate environmental information system with particular focus on

- integrating product and organizational footprint methods, e.g. product and corporate carbon footprint
- support of resource efficiency measures to increase production performance.

The project was conducted in 2014 and early 2015.

II. Introduction

CPF, a subsidiary of the multinational Thai conglomerate CP Group, is a pioneer of product sustainability and has won several awards for achievements in this field. CPF is producing a huge variety of meat-based products and operates large parts of the value chains of chicken, duck, pork, shrimp, and fish. Feed mills, animal farms, hatcheries, slaughterhouses, processing plants and distribution centres are within the company's control and located at several hundred sites throughout the whole country. The organizational structure distinguishes value chain structures ("from chicken feed mill to ready meal"), business unit management (all feed mill operations etc.), and centralized management and services including a department for environmental, quality and food safety standards. For more than a decade, this department has been supporting ISO 14001 certifications and cleaner production measurements [1],[2].

Within the field of Environmental Management Accounting (EMA), tools such as environmental and material flow cost

accounting and product carbon footprinting had been conducted as ad hoc measures due to customer demand or had been limited to certain plants or smaller parts of value chains. In 2014, top management decided to assess the possibilities of establishing a corporate environmental information system (CEIS) to support such tools and assessments in a more systematic and regular manner.

III. Requirements

An initial analysis of CEIS requirements included the assessment of existing information systems, a stakeholder analysis, and a review of the possible applications. Important findings included:

- The need to provide information to and receive data from rather heterogeneous internal stakeholders including information technology and enterprise resource planning experts, environmental officers at corporate headquarters, top managers, site managers, production and environmental engineers, accountants, auditing bodies, product managers and so forth.
- The evaluation that existing information systems such as Enterprise Resource Planning systems, Environmental Health and Safety systems, or emissions tracking tools were of limited value from a holistic point of view but could at least serve as data source for parts of the CEIS.
- The existence of several rather distinct applications including product related environmental assessments (carbon and environmental footprints incl. environmental labels and product declarations), site- and production-line-specific environmental performance assessments (hot spot analysis, ISO 14001), value chain or business unit comparison (environmental performance benchmarks), and company-wide assessments (sustainability reporting).

Based on these findings CEIS requirements were defined, including, among others:

- The demand for integrating cost information and physical environmental data for eco-efficiency and resource efficiency consideration.
- The need for a consistent system that can be used for product- site- and company-specific assessments simultaneously.

- The inclusion of up- and downstream information beyond the company borders for ecological assessments.
- Compendiously, CPF's CEIS should be capable of supporting the whole range of decision settings of the EMA framework^[3] on different organizational and functional levels.

IV. Conceptualization

CEIS have been a research topic since the late 1990s in informatics and accounting^{[4],[5]}. While a range of conceptual papers define generic CEIS architectures or the interaction of existing information systems for integration of environmental information^{[6],[10]}, empirical studies reveal that CEIS are mostly focused on particular decision settings only (e.g., sustainability reporting or product specific life cycle assessments) and frequently achieved by non-integrated software solutions or by standard office applications like Microsoft Excel^{[11],[13]}. The initial situation at CPF, as described above, reflects this observation: CPF's CEIS requirements resemble conceptual academic work in the field while current practice confirms the empirical findings as the company applied isolated software solutions for particular environmental functions.

In recent years, innovative information system solutions have been introduced to the markets that are not yet (fully) reflected in academic literature and research, though. For instance, information system and software vendors (e.g. SAP, thinkstep, enablon, or BSI) have started offering integrated solutions that are capable of serving as fully integrated, comprehensive CEIS. For a number of reasons, including technical, economic, and usability considerations, CPF decided against such completely new approaches and for a combination and integration of existing tools and concepts. The CEIS concept of CPF includes a flexible modelling attempt that allows for "simultaneous" top down mapping of whole business units and bottom up specification of important production steps and units, a simplified concept to incorporate ecological prechains, a consistent method to derive product and organisations environmental footprints from the same data model, and fully integrated monetary and physical information. It consists of several components including:

- A material flow network of the whole company^[14] that serves as central integration platform and as analysis tool for some expert users.
- Excel-based interfaces for data import and export from and to production sites and units.
- Background data for ecological and resource efficiency assessments (aggregated data from global and national life cycle inventory databases, relevant cost data).

- Interfaces to further software and databases to support data input from and result communication to various internal stakeholders.

V. Pilot phase implementation and findings

CPF's CEIS concept has been implemented in a trial run, which covered one chicken value chain of the company. The trial run proved the feasibility of the chosen approach, showing that the CEIS meets its requirements, including the simultaneous assessment of products and processes/sites in ecological and economic terms. However, the pilot phase also revealed some major obstacles for implementing a CEIS successfully:

- Data consistency: Material names, physical units etc. have to be used consistently, but are retrieved from a huge variety of technical and individual sources.
- Data availability: Quite often, physical data (energy and auxiliary data in particular) is missing or measured on highly aggregated levels only (production site, whole building etc.).
- Reliability and accuracy of ecological background data: Despite the growing number of global and local databases for life cycle inventories and environmental impacts, not all purchased goods and auxiliaries are covered or the available data is outdated or rather generic.
- Definition of adequate allocation procedures: Quite a few production steps are multifunctional, i.e. they result in more than one product. Chicken slaughtering, for instance, results in more than 10 different products and by-products. Necessary allocation rules need to reflect both, the current practice in cost accounting as well as the requirements of environmental footprint assessments.

Such observations concerning quality, completeness and availability of physical/ecological data have been made and described before in essentially all fields of environmental management^{[15],[17]}. The fact that these problems still occur could partly be explained by the rationale to collect only such data that is required for a certain purpose, e.g.:

- CPF's ERP system provides precise information on main raw materials, intermediates and final products, but only aggregated information on energy use or auxiliary consumption due to the low importance for production control and management.
- While precise information on hazardous wastes, certain air emissions, and other substances is available due to monitoring or reporting obligations, less information is available when it comes to non-regulated greenhouse gases or the volume and composition of ordinary waste.

- Some data for running environmental management systems (e.g. ISO 14001) is gathered and processed site-specifically; interchangeability of the data is not a major concern.
- Models of product life cycles are suitable for independent third-party verification of product carbon footprints, but do not (have to) incorporate non-product specific “overheads” such as production infrastructure (e.g. building lightings, fork lifts, etc.).

In essence, measuring and collecting reliable and complete physical/ecological data remains an important challenge for the success of CPF's CEIS. Data triangulation and verification, standardized data collection sheets, and employee training by a core CEIS team help to achieve reliable results but increase CPF's efforts in return.

VI. Generalization and conclusion

The alignment of corporate and product environmental footprints, the development of corporate environmental (and sustainability) information systems, the integration of cost-oriented resource- and eco-efficiency assessments and ecological analyses, and its integration with “conventional” information addresses some of the major challenges of corporate sustainability management as described by Schaltegger and Burritt^[18]. This contribution adds to this field of research by providing insights from a practical implementation project.

The first intention was to explain and discuss CPF's CEIS concept in detail. However, pilot phase implementation accentuated the huge importance of the subjacent issue of data gathering and provision. Any (integrated) sustainability management information system relies on the accuracy and quality of its data inputs. At the same time, principles like materiality, completeness, comparability, reliability, and accuracy, for instance demanded by sustainability accounting and reporting standards^[19], remain a huge challenge.

According to the authors' practical experiences in various industries, this observation is independent of the chosen CEIS approach and not limited to the particular situation of CPF, whose efforts in the field are ambitious. A survey among German environmental management information system experts supports this appraisal: Practitioners ranked data quality - particularly consistency and transparency of computations, information and reports - highest priority for design of a CEIS^[7]. The same survey reveals a much lower priority for this issue when academics were polled^[7].

Obviously, companies can improve data quality by increasing measuring and metering activities, and by improving and standardizing data collection and verification procedures. Recent and ongoing software and information system developments are likely to support this and to reduce the required efforts.

Data quality and reliability is a crucial requirement for any CEIS, in particular for comprehensive solutions that integrate product- and site-specific assessments. On that account researchers in the field of EMA and sustainability management should debate if and how their work can contribute to the avoidance of “garbage in, garbage out”.

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