Transforming the linear insurance business model to a closed-loop insurance model: a case study of Nordic non-life insurers

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ABSTRACT

Businesses are expected to become engines for positive change, and mounting evidence indicates that corporate sustainability is a success factor for businesses around the globe. In this context, the ‘business as usual’ approach to running businesses with negative environmental consequences is not an option. Industrial ecology and sustainable business models offer solutions on how this transformation can take place. However, transformation of non-manufacturing industries in this respect has not been covered in the literature. The aim of this paper is therefore is to use scientific and industry literature and interview data from the Nordic non-life insurance sector to propose closed-loop insurance models. The new models allow insurance leaders to move away from running the insurance business in an old-fashioned linear way, and thus gain a better understanding of how the business contributes to sustainable development. The transformation of insurers’ business models is an example of how business models of non-manufacturing industries can be reinvented to support sustainable economic growth by utilizing ideas from industrial ecology. The new business models proposed place insurance business models within the overall research in industrial ecology, thereby filling an evident gap in the literature by showing that the closed-loop concept applies to non-manufacturers.

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1. Introduction

In 1987 the so-called Bruntland Commission – named after Gro Harlem Bruntland, former Prime Minister of Norway – defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987, p. 45). The concept of sustainable development arose in order to address some of the world’s pressing social and environmental issues, and is based on the balance between economic prosperity, social equity and environmental integrity. Today, it is an umbrella concept and is the key policy instrument that links the natural environment with society, while also being used to assess long-term survival of the economy, humans and the environment (Sutton, 2007; Wilenius, 2005). To support sustainable development, the World Business Council for Sustainable Development (WBCSD) has developed a world vision that diverts from the ‘business as usual’ way of delivering economic growth and development (WBCSD, 2010). The Organisation for Economic Co-operation and Development (OECD) stresses the importance of green growth whereby economic growth goes hand-in-hand with green emphasis in order to prevent the non-sustainable use of resources, biodiversity loss and environmental degradation (OECD, 2011, 2013). To support sustainable development, ‘business as usual’ is no longer seen as an option; instead, business sustainability is emphasized, where businesses are expected to look holistically at their operations and at how their actions impact stakeholders and the environment (Network for Business Sustainability, 2012). Furthermore, the emphasis is on shared value, meaning that businesses create economic value while addressing the challenges and needs of society, for instance by redefining value chain efficiency (Porter and Kramer, 2011). Business sustainability derives from previously established concepts of sustainable development, corporate social responsibility, stakeholder theory and corporate accountability theory (Marcus and Fremeth, 2009; Wilson, 2003). As global challenges continue to materialize, opportunities are recognized in different business segments for companies willing to address sustainability in a strategic way (WBCSD, 2010).

Mont (2002) suggests that the service role is growing in importance, for instance repairing items instead of throwing them away, and that companies take responsibility by designing
closed-loop systems that (1) close material cycles, (2) reduce consumption, (3) increase resource productivity, and (4) provide system solutions. This means that it is not enough to focus on the relationship between corporations and customers: the focus has to be on the supply chain as well, from the upstream actions of suppliers to the downstream actions of customers (Hallidórrsson et al., 2009). Supply-chain management (SCM) with green emphasis has been defined as “integrating environmental thinking into supply-chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life” (Srivastava, 2007; pp. 54–55). Although Mont’s article (2002) offers insights into the role of service providers in moving towards closed-loop systems, the greening of supply chains and sustainable business models, it mainly focuses on minimizing impacts from production.

It is frequently claimed that insurers have a relatively low or moderate ecological and/or carbon footprint (CEA, 2009; Garz et al., 2004; The Geneva Association, 2009) as they emit less greenhouse gases than many other sectors (Mills, 2008; Tapiola, 2008). The ‘moderate’ footprint has, however, not been defined, except in the sense that insurers are seen as using fewer natural resources and generating less waste than other sectors (Garz et al., 2004; Storebrand, 2008; UNEP Finance Initiative, 2007) because they offer intangible services instead of producing tangible products. Median emissions by insurers are estimated to be around 3 tonnes of carbon dioxide (CO_{2}) equivalent per employee per year, ranging between 1.2 and 8.3 tonnes per employee annually, which corresponds to the global average emissions per person for transportation energy and exceeds emissions for housing (Mills, 2008, 2009).

The indirect impact of insurers is high, in particular the negative impacts of claims (Meyrick and ClimateWise Sustainable Claims Steering Group, 2010), but solving claims within their complex supply chains is part of an insurer’s core value proposition to clients in terms of their own legal requirements. Customers are buying insurance to reduce their risk exposure, and expect their claims to be resolved by insurers. A ‘clean industry’ mentality among insurers means that many insurers do not have environmental issues high on their list of priorities (WestLB, 2004), which causes them to place a relatively modest emphasis on environmental issues (Johanssonottir, 2014; Johannsottir, 2012). On average, more than 50 percent of a corporation’s carbon emissions consists of indirect emissions from the supply chain, i.e. they do not result from the company’s own operations (A.T. Kearney, 2011; Carbon Disclosure Project and PriceWaterhouseCoopers, 2011). Indirect emissions from insurers may be even greater, as claims-handling processes are to a large extent executed by claims suppliers. A report from insurance giant Allianz suggests that indirect emissions are 76 percent in the case of insurers (Allianz Group, 2012).

Insurers have been identified as potential actors in shifting actions related to corporate social responsibility (CSR) from a marginal to a mainstream business issue, because of their interest in addressing these types of issues and also because of their extensive network (Nelson, 2004). Together with the general public, suppliers, large companies and banks, the sector has also been identified as an important stakeholder in driving the implementation of environmental management systems (Hillary, 2004). The ability to change norms in this way applies to environmental and other sustainability issues.

The Nordic countries – Denmark, Finland, Iceland, Norway and Sweden – are seen as being in the forefront in developing new sustainable business models (Birkin et al., 2009), and the Nordic Innovation Publication and FORA, on behalf of the Nordic Council of Ministers, have recently issued two reports on the topic (Bisgaard et al., 2012; FORA, 2010). However, the actions of financial institutions in terms of environmental issues is an understudied area, as studies of this nature are skewed towards large, heavily polluting firms and producers of tangible products (Birkin et al., 2009; Bisgaard et al., 2012; FORA, 2010). As such, the objective of this paper is to explore the insurance business model, both as a linear business model and as a closed-loop model, using case study data from the Nordic non-life insurance sector and secondary data from the insurance sector. The paper is based on the idea that linear processes of service providers can be improved with respect to the environment by applying the ideology underlying closed-loop systems. The aim is to demonstrate how sustainable business models, i.e. closed-loop models, can be applied to other sectors, with the exception of manufacturing industries, and thereby enhance our understanding of environmental management practices. This is of great importance as “design and management of sustainable business models is an important but yet insufficiently researched area” (Boons and Lüdeke-Freund, 2013, p. 17). The questions being dealt within this article are (1) What does the current scientific and industry literature reveal about the business models of insurers? and (2) How can the business model perspective help transform insurers’ linear business models towards closed-loop business models?

The paper is structured as follows. In Section (2) the business model and sustainable business model concepts are introduced, along with the transformation of business models. Section (3) covers the case selection and research methods. In Section (4) the linear insurance business model is discussed, and a framework of closed-loop insurance models is proposed for the purpose of applying closed-loop thinking to traditional insurance business models. Section (5) consists of the discussion, where the focus is, among other things, on the research agenda concerning sustainable business models and service providers, including insurers.

2. Transformation of business models

Various industries have shown increased interest in sustainable production during the last decade, although this progress is still not resolving global challenges such as climate change, depletion of natural resources and energy supply (Machiba, 2010). It is claimed that making incremental improvements to meet such challenges is not enough: instead, eco-innovation, breakthrough technologies and restructuring of systems and industry must take place in order to attain green growth (Carrillo-Hermosilla et al., 2010; Machiba, 2010). In China, for instance, the development of new business models supporting sustainable development is urgently needed (Birkin et al., 2009).

A business model can be described as the blueprint of a firm’s business logic (Lüdeke-Freund, 2009) and explains the rationale of how companies create, deliver and capture value (Osterwalder and Pigneur, 2009). The key focus is on the firm and its exchange partners, in terms of illustrating the link between the firm and “the larger production and consumption system in which it operates” (Boons et al., 2013, p. 1; Lüdeke-Freund, 2009). A business model for sustainability is, then, “the blueprint of a company’s business logic which internalizes the business case for sustainability” (Lüdeke-Freund, 2009, p. III), where the aim is to have a “lower environmental impact than traditional business models” (FORA, 2010, p. 8).

Business models are in essence narratives explaining how enterprises work (Magretta, 2002), describing the core logic for value creation (Linder and Cantrell, 2000; Teece, 2010). Components of such models include: (1) products and services and the value

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1 A policy think-thank in Denmark.
proposition offered to clients, (2) customer relationships, (3) infrastructure and the network of partners essential for creating value and sustaining good relationships with customers, and (4) financial aspects, including the cost and revenue structures needed to satisfy relevant stakeholders (Boons and Lüdeke-Freund, 2013; Dubossor-Torbay et al., 2002; Voelpel et al., 2005). “As a system of interdependent activities”, a firm’s business model therefore goes beyond the boundaries of the firm by considering the actions of “partners, suppliers or customers” (Zott and Amit, 2009, p. 2). Cooperative collaboration is viewed as a key feature of new business models (Jonker, 2012), while Lozano et al. (2013, 2014) offer examples of how chemical leasing can be used in a collaborative business model as a way of reducing the environmental impact of the chemical business.

When companies try to improve their performance, they may have to abandon their old business models in order to meet the needs of particular customers or other stakeholders (Teece, 2010). Business models are more generic than business strategies, where the aim is to gain competitive advantages by analysing market segments, defining value proposition for each segment, determining how to deliver the value to customers, and working out how business models delivering values can be protected from competitors’ imitations (Teece, 2010). Reinventing business models requires companies to reconsider (1) customer behaviour and new value propositions, (2) technology, (3) business system infrastructure, and (4) economic feasibility and profitability (Voelpel et al., 2005). These types of changes can be incremental, radical or systemic (Bisgaard et al., 2012; Boons et al., 2013; Yip, 2004). The development of new radical business models supporting environmental sustainability is regarded as extremely important, because of their potential to “reduce environmental pollution, optimize the use of natural resources, increase productivity and energy efficiency, and provide a new source of economic growth” (OECD, 2013, p. 6). The OECD report (2013, p. 11) points out that there is a shortage of skills in specific professions and business models, e.g. in relation to “innovative financing schemes”. Transforming old business models to new ones requires a radical strategy (Yip, 2004), while changing business models is similar to the scientific method, where one starts with a hypothesis which is tested to see whether or not it works, and then revises this when necessary (Magretta, 2002).

When embedding sustainability into business systems, the transition has been from end-of-pipe treatment of pollution solutions in the 1970s to a whole-system approach, e.g. closed loops, which simultaneously use resources more effectively and efficiently while minimizing waste (Lozano, 2012). The hierarchy in the evolution of resource-efficient manufacturing concepts and practices was introduced in an OECD report, Manufacturing and Eco-Innovation – Framework, Practices and Measurement, issued in 2009. The hierarchy includes six steps: (1) pollution control, (2) cleaner production, (3) eco-efficiency, (4) lifecycle thinking, (5) closed-loop production, and (6) industrial ecology (see Fig. 1), and moves away from treatment of pollution to synergies, whereby systematic and integrated methods are used to improve sustainable performance (OECD, 2009). Although not discussed in the model, one can assume that the first four levels represent, to some extent, linear models or processes with the purpose of treating, preventing and managing environmental impact, and the expansion of such thinking to companies’ supply chains. The closed-loop thinking is first evident at stage 5, according to the model. Broadly speaking, the models in Fig. 1 can be categorized into two groups: (1) incentive models, where the focus is placed on efficiency (stages 1–3), and (2) life-cycle models (stages 4–6) (Bisgaard et al., 2012). According to Bisgaard et al. (2012), the models in the first group might focus on energy, material and water savings, and on chemical management. Models in the second group include green supply chain management, restructuring of production methods and industrial symbiosis partnership.

The idea of transforming linear processes to closed-loop processes is known in industrial ecology, while transforming linear economies into closed-loop circular economies is also known, for instance in China, where such development is now the country’s “official national development goal” (Mathews and Tan, 2011, p. 435). If the physical flow of material and energy are considered as the main element, it is logical for manufacturing companies to change these into a closed loop as product manufacturing is in every case related to these physical flows. It is more problematic to apply this logic to economies, as economies are not just based on physical flows. In circular economies the idea is to move away from linear models, where resources go in at one end and waste comes out at the other. Instead, closed-loop actions are taken at three different levels: (1) the company level, (2) the cluster or supply
chain level, and (3) the city or municipal level (Mathews and Tan, 2011). In all cases the goal is to identify the flow of energy and resources with the aim of enhancing efficiency. In the same way it can be problematic to apply closed-loop logic to the service sector, where customers fulfill non-material needs with services instead of products. Nevertheless, service companies can gain from applying closed-loop thinking, as they are – at least to some extent – dependent on material and energy flow in order to serve their customers. For instance, they need housing, electricity, heat, and water to run their businesses, and in many cases they need information technologies to carry out their services. In the case of insurers, some elements of insurance transactions can be viewed as physical flows (e.g. claims repair), while others are non-physical (e.g. flow of information), but in both cases closed-loop principles may be used to minimize environmental impacts of the business.

In the following subsections, linear business processes, closed-loop systems, industrial ecology and insurers’ business models are explained. The purpose is to lay the groundwork for discussing the possibility of transforming insurance business models from linear models to closed-loop models, as presented in Section 4.

2.1. Linear business models

Business models of various types, e.g. pricing models, revenue models, channel models, commerce process models, Internet-enabled commerce models and value proposition models (Linder and Cantrell, 2000), are, unless otherwise defined, linear business (open-loop) models. In these models, the supply chain is forward, with the customer usually at the end of the process (Guide Jr. and Van Wassenhove, 2006). In linear business models, an unlimited amount of resources flows one way through industrial systems: from the extraction of raw materials, where materials are transformed into products, to the end stage of disposal, where an unlimited amount of waste is created that ends up in landfills or incinerators (Baungart et al., 2007; Graedel, 1994; McDonough et al., 2003). Although some materials are recycled at the end of the pipe, the materials in question are not designed for recycling. Therefore, a “downcycling, a downgrade in material quality” takes place, limiting usability of the materials (2007, p. 1337-1339).

The linear business process has been described as a “cradle-to-grave” model, illustrating how resources become waste, as opposed to the closed-loop system which is described as “from cradle back to cradle” (Stahel, 1993, p. 16), first described by Stahel in the 1970s (Stahel and Reday, 1976). Adapted from a figure in the European Environment Agency and Eurostat reports on the flow of materials in the economy (EEA, 2012; Eurostat, 2001), Fig. 2 shows a simple version of the material flow in a linear model. It shows how firms utilize input materials that are either domestically extracted or are extracted abroad and imported. Domestic extraction includes fossil fuels, minerals and biomass, as well as water and air. Materials are then used in business processes and production, or are accumulated as buildings, machinery, equipment or other types of durable goods needed for the operation. Recycling is, to some extent, an element of business activities. Additionally, significant amounts of materials are converted into waste and emissions as output. The flow can also be indirect, which here is shown as exports (EEA, 2012; Eurostat, 2001).

2.2. Closed-loop business models

As a way to deal with, and gain from, environmental sustainability issues, companies either transform their operations from linear business models to closed-loop business models or adopt industrial ecology concepts (Fiksel, 2001). The underlying principle for putting environmentally sustainability into practice is sustainable development, as articulated in the Bruntland report (World Commission on Environment and Development, 1987).

Closed-loop business models are made of two supply chains. One supply chain moves products forward from corporations to customers. The other one is reversed, meaning that the product enters the forward chain, or that products are moved into a secondary market (Guide Jr. et al., 2003; Halldorsson et al., 2009), where they can be reused, remanufactured, or recycled. Four types of closed-loop models have been recognized: (1) internal loops, where reuse of materials and waste takes place within manufacturing firms; (2) the post-business model, where the reuse of materials and waste is between distinct business entities; (3) post-consumer, where the flow of products and waste is between firms and customers; and (4) post-society, which involves recycling of materials (Wells and Seitz, 2005).

The centre of attention in a closed-loop system is the saving of resources and minimizing of waste, either through reuse of goods – therefore slowing down “the flow of materials from production to recycling (or disposal)” – or recycling of material which does not slow down the flow but closes the loop between production and post-use of raw materials (Stahel, 1993, p. 14). According to Stahel (1993, p. 14), saving resources and reducing waste can be done in three different areas: production, utilization, and post-use of materials.

The relevance of closed-loop models to circular production is highly evident, as the term ‘closed-loop production’ (Bisgaard et al., 2012; Machiba, 2010) has a similar definition to that of a closed-loop system or a model. Fig. 3 shows an example of a closed-loop production system (OECD, 2009).

Environmental characteristics of closed-loop models or production involve a responsibility for products throughout their lifecycles (Stubbs and Cocklin, 2008). A combination of eco-design strategies is used to minimize total environmental impact over the whole lifecycle of products, and includes (1) a selection of low impact materials, (2) reducing waste or the volume of materials in products, (3) using cleaner technologies, (4) reducing impacts of packaging and distribution, (5) reducing impacts, e.g. energy consumption, from the use and maintenance of the product, (6) optimizing the life of the product through durability, and (7) reuse, remanufacture, recycling or disposal of the product at the end of the product’s life (Roy, 2000; pp. 290–291).

Furthermore, it is suggested that manufacturers have eight options for minimizing environmental impacts once products have been returned to the company through reversed logistic supply chain systems (Jayaraman, 2006). Jayaraman (2006) suggests (1) selling products as used products, given that they meet sufficient quality levels, (2) cleaning and repairing products by fixing and replacing failed parts, (3) selling products as refurbished units, (4) remanufacturing products, (5) retrieving valuable parts of the products, (6) recycling products, (7) recovering energy through incineration of products, and (8) disposing of the products.
2.3. Industrial ecology

Industrial ecology (IE), defined as "the study of all interactions between industrial systems and the environment" (Graedel, 1994, p. 23), focuses on the material and energy flow through industrial processes and systems. Industrial symbiosis partnership and eco-industry parks are examples of how industrial ecology is operationalized. The aim is to imitate fundamental characteristics of natural systems where there is no waste, "since one creature's waste becomes another creature's food" (Fiksel, 2001, p. 1267). Industrial symbiosis focuses "on the greening of an entire system and can therefore be considered as systemic innovation" (OECD, 2013, p. 8), although to what extent the systems become green depends on where the system boundaries are drawn. It is based on the sharing of resources and by-products amongst industrial partners through inter-business recycling linkages. The purpose of industrial symbiosis is to lower the costs and environmental impacts of the industrial symbiosis partners (FORA, 2010).

Linear and closed-loop systems, as well as industrial ecology models, are mainly discussed in relation to product or process-based business models (OECD, 2013). In such cases, the focus is on manufacturing systems; the fact that this type of thinking may also apply to other types of industries, including the insurance sector, is not taken into account.

2.4. Insurers' business models

The insurance system is very complex and fragmented (UNEP Finance Initiative, 2009). Primary insurers offer protection to individuals, firms and other types of clients. Underwriters assess and price the risk, and loss adjusters assess claims (UNEP Finance Initiative, 2009). The purchase of insurance coverage is a way of managing risk and preserving wealth in case of claims, and is therefore a critical aspect of financial planning. Although the insurance system in general is structured around (1) property and casualty (non-life) and (2) life and health insurance, this paper focuses entirely on the non-life insurance business. The non-life insurance business provides coverage against various risks depending on the nature of the cover, including auto, homeowner, commercial, business interruption and liability insurances. Moreover, the non-life business is classified along personal lines and provides coverage both to individuals and to commercial lines servicing businesses and the economy. The risks of businesses are more specialized than the risks of individuals, and therefore their policies are often customized.

It is essential to define insurers' business models more specifically before trying to transform the models from linear to closed-loop models. The insurance underwriting process has four key steps: (1) receiving the application directly from customers or via insurance agents, (2) underwriting and policy design, (3) documenting coverage and issuing a policy, and (4) invoicing (Anichini and Chan, 2008). According to Anichini and Chan (2008), there are several sub-processes, including the discovery and validation of applicants' submitted information. The steps in the discovery and validation process differ depending on policy types, i.e. vehicles, properties, life or health, while also depending on the different types of customers, i.e. whether they are individuals or corporations. Underwriting also differs between insurance types, sometimes requiring extensive examination at a customer's site. The information is then analysed to determine insurability, followed by an evaluation of the risk, rating class and premiums (Anichini and Chan, 2008).

A description of the underwriting process offered by Anichini and Chan (2008) only provides part of the picture when discussing insurers' business models. The missing steps include policy renewal and claims. The premiums paid must be fair and correspond to, or exceed, expected losses paid by insurers. The customers gain 'peace of mind' as the policy will cover his or her loss if it occurs. If nothing happens, the insurance is renewed, usually annually or semi-annually, unless the policy is cancelled by the customer or, in some cases, by insurers. Fig. 4 shows the linear insurance business process.

If a claim occurs, a new process starts. The claims process, along with its environmental impacts, can be explained using an example of the property claim process. When a property claim occurs, it sets in motion the process of inspection and correction, which is sometimes followed by damage inspection before the claim is settled. If damage is to be repaired, a constructor inspects the claim and the repair process starts. Damage repair is performed by claims partners, thereby minimizing the direct environmental impacts of claims as the environmental impact take place downstream in insurers' value chains. The claims process differs greatly depending on the type of policy, ranging from cash payments to extensive restoration projects that require a great deal of energy, water and resources, as well as treatment of waste and pollution. Fig. 5 summarizes the main steps in the property claims process and the direct and indirect environmental impacts of insurers (If P&C Insurance Company, 2010).
3. The research approach

The aim of this paper is to investigate whether the insurance business model can be transformed from a linear model to a closed-loop business model. The research objectives were met by investigating insurers’ business models and business models from industrial ecology and by using descriptions of business models and claims-handling methods offered by interviewees in this case study. Use was also made of secondary data published by insurers on their websites and in their annual corporate social responsibility, sustainability or climate change reports, both to enhance international relevance of the results and thereby adding depth to the discussion about linear and closed-loop business models and for triangulation.

3.1. The Nordic case

The Nordic countries have a strong environmental profile within the European Union (EU). They are regarded as pioneers when it comes to protecting the environment and in corporate social responsibility (Gjølberg, 2013; Magnúsdóttir, 2009). The environmental forerunner role of the Nordic countries was an influential factor when selecting Nordic insurance companies as cases for the study, as they offered the possibility of discussing best practice examples with regard to solving environmental sustainability issues.

Tables 1 and 2 list the biggest insurance companies operating in the Nordic region in terms of market share on a national and/or regional scale. Insurance companies in the island communities (Table 1) – Åland, the Faroe Islands and Iceland – are small and medium-sized (SMEs), meaning that they employ between 50 and 249 persons (Eurostat and Schmiemann, 2009). All of these companies permitted access to their executives and specialists for interviewing.

Companies operating on the mainland, i.e. in Denmark, Finland, Norway and Sweden, are listed in Table 2. These companies are large, with the number of employees ranging from 400 to 7000. Companies marked with the same degree of shading belong to the same insurance group, meaning that there are 12 individual insurance entities. Of these 12 insurance companies/groups, 8 allowed primary data to be collected through interviewees at their sites.

Primary interview data was collected in the participants’ local environment by visiting company sites to interview insurance executives and specialists. Interviews took place from September 2009 through September 2010. A series of interviews with 74 persons from different functional areas was conducted (see Table 3). Interviewees were selected by each company on the basis of their expert knowledge in this field. Participant observation was carried out, e.g. participation in Nordic insurers climate change conferences in 2009 and 2012, as well as visits to insurers’ claims partners association and to developers of loss prevention devices.

Table 4 shows interviewees’ roles within the companies. Each company selected interviewees based on their expert knowledge in this field. In the island companies, most of the interviewees came from administration and from claims and loss prevention divisions. Although some of the interviewees in the mainland companies came from these divisions, many of the interviewees came from corporate social responsibility (CSR)/sustainability divisions.

3.2. The research design

Fig. 6 is a flow chart showing the key steps of the research design. The first step was to define research boundaries and select

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**Table 1**

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**Table 2**

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companies to be approached. Companies were selected based on their size (large in their home country), while research boundaries were based on the climate change statement issued by insurance companies at the Nordic insurers’ climate conference in 2009. According to the statement, insurers’ core activities with respect to climate change include: (1) products, (2) loss prevention and claims settlements, (3) investments, (4) own operations, and (5) follow up/benchmarking of actions. The second step in the process was to contact potential companies. Conference participants’ e-mail addresses were used to contact the biggest Nordic insurance companies in order to gain access to the selected companies. The third step was making field trips to the companies in question.

In addition to interview data, multiple sources of data were also examined. Secondary data included company presentations, reports and information on websites, both for triangulation purposes and to gain a broader perspective on insurers’ environmental activities. A field note framework was developed and filled out for each interview. It included the following topics: (1) access to the company and pre-interview communication, (2) entering the field, (3) field description, e.g. photos, (4) information about interviewees, (5) activity, (6) office equipment and layout (e.g. drawings or photos), (7) events, (8) timeframe, (9) word-for-word interview transcripts, (10) leaving the site, and (11) reflections. Additionally, the latest information presented at the Nordic insurers’ climate conference (NICC) in September 2012 served as an update for the interview data. The fourth step was analysis of the data, described below. The fifth and final step was a member check, meaning that in some cases interviewees or insurance experts were asked to review drafts of the findings for verification.

3.3. Analysis of findings

The analytical process started parallel to data collection. Interviews were transcribed verbatim. During and after the transcription of each interview, the text was read thoroughly, line-by-line, to see which themes emerged from the data. This was done as an open coding process. Parallel to the transcription, a mind-map was created for each company in MindManager 8. This was done to keep track of themes, to cluster ideas, and to provide details supporting the themes, see two branches of a company map as an example in Figs. 7 and 8.

Multiple methods were used for data analysis, e.g. open coding process, theme analysis, content analysis, cross-case analysis and the constant comparative method (Glaser and Strauss, 1967; Kvale and Brinkmann, 2009; Yin, 2003). The purpose was to find examples of how Nordic insurers deal with environmental issues affecting their business. These findings have been used to develop the linear and closed-loop insurance models presented in Section 4.
3.4. Validity, reliability and generalizability

According to Creswell (2007), Whittemore et al. (2001) put forward 29 procedures for validating quality and reliability of qualitative work. This applies to designing the research and to gathering, analysis, and presentation of the data (Creswell, 2007). Eight of the techniques are frequently used. Creswell (2007, p 209) suggests that “qualitative researchers engage in at least two of them in any given study”. Techniques used in this research include: (1) prolonged engagement and persistent observation in the field, (2) triangulation, where data was drawn from multiple resources, (3) peer review and member check (by interviewees) of findings, (4) rich, thick description, and (5) external audits of insurance professionals.

4. Findings: transformation from a linear insurance model to a closed-loop model

This section is divided into three sections. In Section 4.1 the focus is on the ‘relatively’ moderate environmental footprint of insurers. Section 4.2 expands the model, including the impacts of claims. Section 4.3 provides the closed-loop business model of insurers.

4.1. The ‘moderate’ environmental footprint of insurers

Before transforming the insurance linear business model to a closed-loop model for the purpose of integrating sustainability aspects into insurers’ business models, it is necessary to explain why this type of transformation has not taken place previously. This is partly due to the mindset fostered by the comparatively moderate environmental footprint of insurers because of the intangible service insurers offer. However, by claiming this moderate footprint they do not take into account the environmental footprint of claims, see the following interview quotations.

- This is essentially not a polluting business with major environmental impacts. We do not have a large fleet of vehicles or such.
- As a service provider, we know we are not a big polluter.
- Our business is not polluting business.
- Our industry is not a polluting industry.
- Our environmental burden isn’t that large.
- We will never be accused for being that big polluter, so to speak, and that’s also why the financial sector might be regarded as quite slow compared to other industries.
- I would say that our business is not the most important [from a climate perspective], because we are not a factory.
- Environmental impacts of insurance companies are small.
- We are selling non-materialistic [intangible services]. We don’t need any energy to produce them.

Fig. 9 shows key steps in an insurer’s linear business model, including inputs and outputs of energy and materials needed for the intangible service that insurers offer, which represent the ‘moderate’ environmental impact. The white boxes in the middle represent a simplistic version of an insurer’s business model, previously shown in Figs. 4 and 5. A yearly feedback loop takes place through the renewal and payment process if no claim occurs. The key question, however, centres on what customers are paying for. Isn’t the insurance company legally obligated to amend damages when claims occur? In this case the process changes, developing tangibly into a process which leads to the environmental footprint of insurers becoming much greater. The grey boxes demonstrate environmental impacts upstream and downstream related to insurers’ office activities, ignoring impacts from claims. The upstream activities cause environmental impacts because of supplies purchased from outside parties to run the daily operation. There are also direct impacts from the use of energy and water for the office. This increases the overall environmental footprint, including carbon and water footprints. The downstream environmental impact is because of office waste.

Energy, such as electricity, gas and fossil fuels, is used to produce office supplies purchased by insurers. It is also consumed in buildings occupied by insurers, in business travel and in IT processes. A limited amount of water is needed for office activities, but water is also used in producing paper and other goods consumed by insurers. Material inputs include, for instance, office furniture and equipment, paper for insurance terms, invoices, policies and promotional material, food for the canteen, detergents for cleaning, etc. Waste and pollution includes emissions to air and water, as well as e-wastes, office furniture, supplies and food scraps. The linear process does not take into account reduction, reuse or recycling of the aforementioned waste.
4.2. The ‘realistic’ environmental footprint of insurers

The fundamental purpose of insurance is to prevent losses, protect lives and compensate for economic losses. Therefore, it has vital social and economic elements. The right insurance coverage can get people and businesses back on track after claims events that would otherwise ruin their financial circumstances. One can argue that the indirect environmental footprint of claims is not an issue insurers have to deal with, as claims are handled by third parties. However, this is not true for IT services or cleaning services that insurers outsource to third parties. Claims processes are the focal point of the insurance business. Claims form part of insurance terms and conditions, the value proposition offered to the customers. Were it not for the probability of claims, there would be no need for insurance coverage. Customers are buying insurance to reduce their risk exposure, and they expect their claims to be settled by insurers or their partners when they occur. Repair processes are done in the name of the insurance company, reflecting negatively upon insurers if done poorly. Claims services provided by third parties are therefore closely linked to the image of insurers, while maintenance of the office or IT solutions chosen for the office are not. Furthermore, it is the role of insurance companies to deliver the properties in a pre-accident condition, meaning that the notion of a small environmental footprint can be challenged. Cash payments are often used to settle claims, and in such cases the customer handles the claims process him/herself. In that case, it is harder for an insurer to influence environmental improvements, as it is the customer who chooses how the damaged property is replaced. The following quotations from interviewees illustrate this point:

- Our claims supply chain – this is the point where insurance actually becomes tangible. If somebody has a claim, we are their basic insurer. We work our ways to make our claims more sustainable, we are using sustainable timber, organic carpet called compostable carpet [and] energy-efficient appliance upgrades. Often consumers just want the money, but you know where we are involved we make a difference.
- We try to fit as much as we can into the claims assessment, and then pay settlement payment … when we have done the claims assessment and paid the settlement fee, we are no longer supervising the process.
- We encourage them to get a new one [electronics].

The close ties between insurers, claims suppliers and partners means that insurers are in an excellent position to influence environment-friendly claims repair through reduced energy, water and resource consumption, as well as through waste treatment.

Fig. 10 shows an example of an insurance business model, with a ‘moderate’ footprint of office activities and a more realistic one which includes the impacts of claims. Here, grey colours represent the input and output of environmental impacts of the service. In the case of the ‘realistic footprint’, there is an additional claims feedback loop showing broadly how the model changes when claims are included in the process, see the boxes with stripes. Direct service is intangible, meaning that material and energy inputs are
limited compared to that from manufacturers, and the same applies to waste output. When claims occur, the process becomes tangible, with immense use of resources and waste load, including hazardous waste. There is a huge difference between input and outputs in the direct office model and the indirect one including claims. Material inputs, for instance in the car claims process, consists of material needed for repairs, car parts or new cars in case of total losses. This means that insurers indirectly consume energy, material and water, leading to greenhouse gas emissions at various points throughout the supply chain. In complicated vehicle repair processes, steel, aluminium, plastic, glass, rubber, minerals, paint thinner, upholstery, leather and so forth are used, as well as energy and water. The waste output also becomes greater and often hazardous, owing to damaged cars and parts. Insurers, however, buy the repair services from third parties, therefore minimizing their own direct environmental footprint.

What makes the insurance business model complex is that suppliers are both upstream and downstream in the model, e.g. the business partners use various types of inputs in their repair processes, which are paid for by insurers directly or indirectly when costs of claims are settled.

One barrier to the transformation of the insurers' main business model, in addition to entrenched views on the industry's "moderate" environmental footprint, is the 'replacement mindset' shared by customers, suppliers and insurers, which results in damaged assets being replaced outright when they might instead be repaired with used parts at a lower environmental and financial cost. When making repairs, disposal of old parts can be avoided as well as consumption of energy and the raw material needed for producing new parts. This has been demonstrated in industry reports focussing on the issue. For instance, when the side panel of a Peugeot 307 is repaired instead of being replaced, it saves up to £753, or approximately US$1150 (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010). However, the believe is that sustainable claims repair (such as reducing unnecessary replacement of building components and/or contents) costs more (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010, p. 2).

4.3. Insurers’ closed-loop business models

Nordic insurers claim that their businesses have a relatively modest environmental impact (Gjensidige, 2011; If P&C Insurance Company, n.d.), but they also recognize the indirect environmental impacts through their suppliers and the opportunity of

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**Fig. 10.** An insurer’s business model with environmental impacts of claims.

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**Fig. 11.** An insurer’s business model, including the claims process.
influencing suppliers through special requirements, thus reducing the environmental impact of their business.

Grounded in the literature review and interview data, Figs. 11 and 12 show the non-life insurance process as a closed-loop system for the purpose of linking the direct and indirect impacts of insurance operations discussed in the previous sections. Fig. 11 shows a double loop system, including the direct impact of claims in loop 1 (white boxes) and the indirect impact of claims in loop 2 (grey boxes). In addition, there is the third process, the strategic process, in the upper-right-hand corner (the box with stripes), which influences product and process design, suppliers' actions, controlling actions, and so forth. Three boxes with a dot pattern show the input needed and output created for carrying out insurers’ and claims activities. In these flow charts, the service and claims processes are combined for the purpose of reducing environmental impacts. The insurance process on the right-hand side starts at the top with an application and continues into underwriting, issuing of policies, premium payments and mid-term changes, which can be frequent. Transportation of risk surveyors is included in the underwriting process. If no claims occur, the process repeats with annual or semi-annual renewals, followed by premium payments until a claim occurs or the policy is cancelled. Although energy, water and resources in the form of office supplies are needed to carry out the whole insurance risk-period process and the strategic process, emissions to air, water and soil, along with solid waste, take place at all stages. Inputs and outputs are only shown at the start and end points of the process. At all stages the aim is to reduce consumption, e.g. through energy, water and resource efficiency, waste and emission reduction, and process improvements. If a claim occurs, loop 2 starts. This process needs an enormous amount of energy, water and material input. The claims process includes claims notification, reviewing of the claim, determination of liability, inspection and estimation of cost, and then repair, replacement or cash payment, depending on the nature of the claim.

The second version of the closed-loop model, shown in Fig. 12, shows the waste hierarchy of the EU Waste Framework Directive (2008/98/EC) as part of the claims loop. From the most preferred to the less preferred option, the hierarchy is in the following order: reduce, re-use, recycle, energy recovery and disposal. However, this sequence is not always possible, and in complicated claims more than one method is applicable. This type of thinking needs to be applied when designing a closed-loop model of the insurance business.

The environmental emphasis of insurers will have an impact on their service partners, and can have positive snowballing effects on sub-suppliers as well. This type of influence was seen as critical by interviewees for reducing the overall environmental impact of insurers.

- Subcontractors will also have to live up to the requirements [the company makes] to its contractors.
- They [management] are putting pressure on suppliers, cleaning, and waste-handling companies.
- We are renovating or making some changes in our buildings and we are trying to teach our building firm to separate their waste carefully. And it's very cheap for them if they take out the wood and the concrete as it is free if they [sort it].
- In the building sector we have [a supplier]. This is quite a big company and they have this environmental project, because they recycle all the waste they get from buildings. That was one of the reasons why we selected them. It's part of our principles when we select our partners.

Four of the biggest companies included in the study jointly handle around one million vehicle claims annually, together with approximately 150,000 claims in homes and commercial buildings, and have contracts with thousands of building contractors and craftsmen, purchasing building materials for huge sums as well. The pressure on the suppliers would be that they demonstrate their choice of transportation, materials, equipment, emissions and waste handling. To reduce environmental impact, at all stages in the process it is also important to choose alternative materials that are known to have less negative environmental impact. Quality in claims handling also minimizes negative impacts of claims:

- But if we talk about building claims and if we talk about water damage, we typically do not want to pay cash in a water claim.
We want to make sure that the damage is repaired in the right way, so that we don't end up with a new claim in one or two years or something like that.

Insurers have high bargaining power towards suppliers due to long-term relationships (Ciliberti et al., 2008) and their financial strength, and are therefore in a unique position to bring down indirect environmental and climate footprints throughout the supply chain. One way to measure results is to measure the overall emissions of the supply chain by using scope 3 of the Carbon Disclosure Project (CDP) measures (Young, 2011), including direct and indirect activities; indeed, CDP measures are used by some of the companies included in the study. A case study carried out in the United Kingdom (UK) has furthermore shown that collaboration with suppliers to reduce physical waste and unnecessary costs led to a 34 percent reduction in the carbon footprint and a 42 percent reduction in energy bills. Customer satisfaction also increased, as less time was spent waiting for repairs than for replacement parts. In the case of construction waste, up to 83 percent of the waste can be handled in an environmentally friendly manner (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010).

Claims management with the aim of reducing environmental impact includes steps such as involvement, co-operation and incentives, training, targets, benchmarks, monitoring, and measures against targets. The uptake of sustainable materials, defined as "materials from renewable sources that can be produced at high volumes without adversely affecting the environment or critical ecologies" (Rutgers, 2010), is also crucial. In the UK, voluntary Sustainable Claims Management (SCM) guidelines for insurers to commit to are being developed. For instance, in the case of property damage, removal of building materials is substantial but can be minimized by repairing instead of replacing; by reducing the amount of old finishing going to landfills; and by less use of new material and thus less use of resources, energy and transportation. Other examples found in UK content and property insurance policies include replacing home appliances with energy-efficient models (A-rated), rebuilding severely damaged properties with sustainable building materials and improving the energy efficiency of buildings, which can reduce the CO2 emissions from homes rebuilt after claims damage by up to 44 percent (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010).

The first insurance products in the Nordic region — car and house insurance products from Folksam — have already been approved for the "Bra Miljöval" (Good Environmental Choice) eco-labeling. Other companies are also interested in eco-labeling their products, or are in the process of assessing the criteria for doing so (Naturskyddsforeningen, 2010, 2011a, 2011b). Since labeling its products in 2010, Folksam claims that the company has reduced its landfill by 1138 tonnes by sorting waste. In addition, customers will get eco-friendly substitutes when their properties are repaired, while company savings have reached SEK 633 million, which the company intends to spend on additional improvements for its customers (Folksam, n.d.).

5. Discussion

This section revisits the research questions posed in the introduction to this paper, and considers further issues in the light of the analysis of business models and the transformation of insurers' business models from linear models to closed-loop business models, thus moving away from the 'business as usual' scenario (WBCSD, 2010) and supporting the green growth strategy of the economy (Machiba, 2010; OECD, 2013). The main focus of this section remains dominated by the two research questions: (1) What does the current scientific and industry literature reveal about the business models of insurers? and (2) How can the business model perspective help transform insurers' linear business models towards closed-loop business models?

The roles and responsibilities of the insurance sector are important from an environmental perspective. This is due to the size and financial strength of the sector, insurers' interconnectivity in the society, the number of insurance policies and the claims-handling processes. In that sense, the core aspects of the business can be utilized in a positive way when addressing environmental issues, for instance by minimizing environmental impacts of claims by collaborating with or placing requirements on claims partners. The literature on sustainable business models of insurers is non-existent, and in the few relevant publications the process is generally shown as a linear process (Anichini and Chan, 2008; IF P&C Insurance Company, 2010), thus failing to demonstrate the business model for sustainability (Ludke-Freund, 2009) with the purpose of lowering impact from the traditional business model (FORA, 2010). These linear models do not suggest how the environmental impact of insurers can be minimized. These models, furthermore, only show part of the picture as they barely take into account, if at all, the impact of claims (IF P&C Insurance Company, 2010). However, business models go beyond the boundaries of a firm, e.g. considering the distinct characteristics of insurers (Zott and Amit, 2009), in this case claims partners. This supports the ideas of Jonker (2012), who discusses the importance of cooperative collaboration in relation to new business models, and the ideas of Porter and Kramer (2011) on how shared value of business and society can be created by focussing on shared value, for instance through value chain efficiency.

One of the implications of the study is the evident gap in the literature concerning sustainable business models and non-manufacturing sectors. The literature and development of sustainable business models is heavily skewed towards large, heavily polluting firms, producers of tangible products and product or process-based business models (Birkin et al., 2009; Bisgaard et al., 2012; FORA, 2010), not taking into account that some of the concepts may actually apply to non-manufacturers. Although Mont's article (2002) offers insights to the role of service providers in moving towards closed-loop systems, it mainly focuses on minimizing impacts from production.

When looking at the hierarchy in the evolution of resource-efficient manufacturing concepts and practices (OECD, 2009), as shown in Fig. 1, and the transformation of insurers' business models, as shown in Figs. 11 and 12, it is apparent that insurers' business models can move to higher levels of the OECD model, although it is not obvious if and how the highest level of the model, industrial ecology, can be reached, as it is not clear how waste from one company can become resources for another (Fiksel, 2001) throughout insurers' whole supply chains.

However, insurers' business models can be radically transformed from incentive models to life-cycle models (Bisgaard et al., 2012), with the potential of shifting actions relevant to business sustainability from being a marginal to a mainstream business issue because of the extensive network of insurers (Nelson, 2004). The challenge, however, is to find out what type of take-back models can be utilized. Because of the complexity of insurance business models, a combination of business models suggested by Wells and Seitz (2005) might have to be considered. These include internal loops, where reuse of material and waste takes place within firms of claims partners; post-business models, where reuse of material and waste are between distinct business entities: post-consumers, where the flow of products and waste is between firms and customers; and post-society, involving the recycling of materials. A combination of eco-design strategies introduced for product-service systems (Roy, 2000) is also relevant, as well as the options
recognized for minimizing environmental impacts once products have been returned to the company through reversed logistic supply chain systems (Jayaraman, 2006). A radical transformation (Bisgaard et al., 2012; Boons et al., 2013; Yip, 2004) of insurers’ business models is a way for insurers to take a holistic view of their operations and of how their actions impact stakeholders and the environment (Network for Business Sustainability, 2012). Insurers need to examine the upstream actions of suppliers as well as the downstream actions of customers (Halldórsson et al., 2009) and claims partners. They must also look at how the sector can take responsibility throughout the product lifecycle (Mont, 2002), in this case the lifecycle of insurance and the negative impacts of claims (Meyricke and ClimateWise Sustainable Claims Steering Group, 2010).

6. Conclusions

It is not as straightforward to develop closed-loop business models for service companies as it is for manufacturing companies, as delivering service requires less material and energy. Even so, principles of closed-loop systems are already being used to transform economies in order to move away from linear models by influencing closed-loop actions. Although material and energy flows are less important to service providers than to manufacturers, all industries require to some extent these material flows, buildings, equipment or other types of durable goods to provide their service. Therefore, the same principles can be used to achieve changes in business models of service sectors, including huge sectors such as the insurance sector which can be considered both as a service provider and an industry that relies greatly on material and energy flow in the claims-handling processes.

Developing closed-loop insurance models is not a goal in itself, although it can lead to more sustainable performance. Instead, the ultimate goal is to increase the sustainability performance of insurers by using improved business models. This paper proposes a new type of business model for non-life insurers (embedded in Figs. 11 and 12), in order to examine the possibility of reform that can contribute to greater sustainability. The new business models demonstrate a closed-loop insurance system, including impacts from claims, which research on industrial ecology, sustainable innovation, and sustainable business models has up till now neglected to study to a large extent in terms of whether and how processes of non-manufacturers can be transformed from linear business models to closed loops.

The implication of the new models is that it allows insurance leaders to move away from running the insurance business in the old-fashioned linear way (see Figs. 4, 5, 9 and 10), based on the assumption that the business has a moderate environmental impact, and thus understand better how the business contributes to sustainable development. The transformation of the insurers’ business model is an example of how business models of non-manufacturing industries can be reinvented to support sustainable economic growth by utilizing ideas from industrial ecology. The new business models proposed place insurance business models within the overall research on industrial ecology, thereby expanding the scope from mainly focussing on manufacturing industries – which is the current situation – to non-manufacturing industries.

This paper contributes to the literature in the following way: First, the lack of attention to ‘non-manufacturing firms’ in the current literature on sustainable business models becomes evident, thus suggesting future research opportunities. Second, the closed-loop model, or other types of alternative business models for insurers, offers a new way of viewing the insurance process in the context of sustainability issues, both for researchers and practitioners. Third, as this is the first attempt to develop closed-loop models for insurers, future work might improve the models, particularly identifying in greater detail specific features of the models. Fourth, the reversed supply chain of claims in the business model has to be explored further to see how claims-related products can be re-used in the closed-loop insurance business models. Fifth, further research is also needed to study the mindset of insurers with respect to business models. The replacement mindset evident in claims processes, along with the mindset inherent in the relatively moderate environmental footprint of insurers, offers the chance of studying what influence these have on insurers’ environmental sustainability actions – or the lack thereof – and thus enhancing our understanding of environmental management practices.

The study is not without limitations. The findings are based on interviews with executives and specialist from the Nordic insurance sector, meaning that generalizability can be questioned. At the same time, this limitation offers research opportunities. Studies can be carried out to see if the model applies to insurers in other regions, and whether applying the model can lead to quantifiable environmental improvements. Additionally, the study proposes that insurers are responsible for the environmental burdens imposed by their own internal operations, and to some extent the burden of their claims partners. The question of how far financial institutions are responsible for environmental burdens of the businesses and industries that they support via investments is yet to be explored. Furthermore, the paper opens up a wider debate about business models for sustainability in the service sector, for instance in utilizing the closed-loop ideology that is well known in manufacturing but virtually unknown in the service sector.

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