

Evolving management accounting : An account of dynamic capabilities in eco-target costing

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Evolving management accounting: An account of dynamic capabilities in eco-target costing

Hannu Kurunsaari

1. Introduction

Today, cities, societies, and organizations are attempting to become more ecologically sustainable. How this change takes place, and how management accounting can assist in this, are pressing questions for many firms. There has been considerable research on the external pressures on organizations that force them to comply with basic levels of ecological sustainability (Patten, 1991; Larrinaga-Gonzalez and Bebbington, 2001; Deegan, 2002). However, considerably less scholarly effort has been devoted to investigating how an organization's management accounting practices evolve under pressures to become more sustainable.¹⁾ To facilitate a greater understanding of the evolution toward sustainability, I employ the concept of capabilities. A capability, whether operational or dynamic, refers to the ability or capacity to perform a particular task or activity. It consists of patterned and repeated activities, that is, routines (Helfat *et al.*, 2007). Capabilities themselves relate to the institutions and actions that direct the evolution of capabilities (Burns and Scapens, 2000; Coad and Cullen, 2006). Many management accounting mechanisms can be considered dynamic capabilities that reconfigure organizational processes. Further, management accounting has a certain capacity to support ecologically conscious designing, that is, eco-design, and environmental management. Nevertheless, dynamic capabilities are not easy to describe; therefore, I draw from the work of Mouritsen *et al.* (2001) while presenting an account of dynamic capabilities in eco-design with respect to target costing.

The current study investigates the process by which practices of environmental management and eco-design are institutionalized within the context of target costing, a Japa-

Keywords : Dynamic capabilities, Eco-design, Target costing, Sustainability

nese management accounting method. First, the study develops the framework of the capabilities that are framed by the realms of institutions and activities. Secondly, it examines the case of Toyota and its activities that are related to environmentally conscious target costing, i.e., eco-target costing. Finally, the current study discusses the overall results and describes the dynamic capabilities of eco-target costing.

2. Literature review and framework

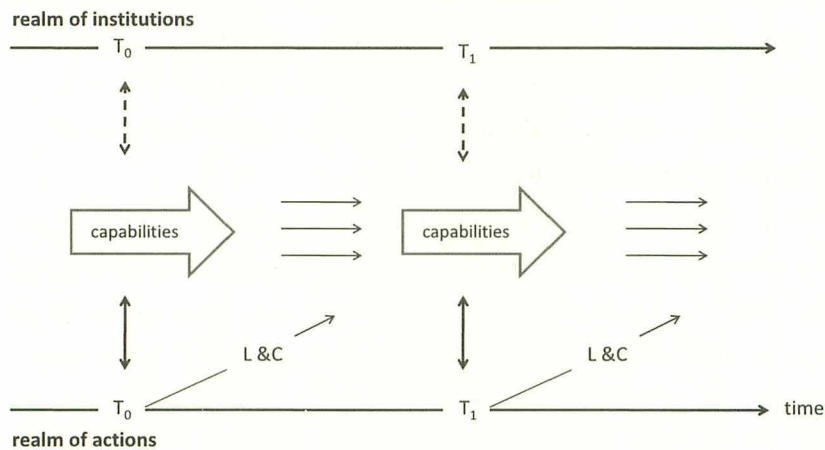
Why should individual firms seek ecological sustainability? First, firms are organizations that compete with each other not only for resources and customers but also for political influence, institutional legitimacy, and social and economic fitness (DiMaggio and Powell, 1991). Today, they also compete in the realm of sustainable development. Moreover, environmental regulations, expensive raw materials and energy, customer willingness to purchase eco-friendly products, and ethical concerns create compelling reasons for firms to become integrated members of industrial ecology (i.e., closed loop, zero-waste systems). External institutions, such as national legislators and international organizations play crucial roles in imposing environmental pressure on firms. Nevertheless, firms have found it time-consuming and frustrating to institutionalize practices concerning environmentally conscious management and eco-design.

When Burns and Scapens (2000) developed their framework for the institutionalization process, they explored the ideas of old institutional economics (OIE) as well as evolutionary economics (Scapens, 1994). They defined an institution as “the shared taken-for-granted assumptions which identify categories of human actors and their appropriate activities and relationships” (Burns and Scapens, 2000, p. 8). This could be interpreted to mean that institutions are shared meanings between people in situations featuring repeated interaction that guides the behavior of human actors. This guiding is enforced by rules, policies, norms, and expectations that govern behavior in social settings (Coad and Cullen, 2006). On one hand, institutions impose form and social coherence on human activities; on the other, institutions themselves evolve through a process by which those activities are made routine (Burns and Scapens, 2000). Therefore, the important concept here is “routines,” and much of our understanding of them is based on the evolutionary model by Nelson and Winter (1982). The term “routine” is often associated with behavior that is learned, highly patterned, repetitious, or quasi-repetitious (Winter, 2003). Routines act as durable stores of tacit knowledge and skills, and can be adopted habitually by groups of individuals (Burns and Scapens, 2000). This concept of “routines” is

requisite for understanding “capability,” the ability to perform tasks in a minimally acceptable manner²⁾ (Helfat *et al.*, 2007). Essentially, capabilities consist of routines;³⁾ thus, they are durable and semi-permanently bound to the organization (Grant, 1991). They are durable in the sense that they are not “worn out” in use, and bear a form that is shaped by actions and institutions. Capabilities can generally be divided into two groups: operational and dynamic.⁴⁾ Operational capabilities enable a firm to perform existing tasks reliably, whereas dynamic capabilities enable a firm to change and learn (Helfat *et al.*, 2007).

Coad and Cullen (2006) referenced the work of Burns and Scapens (2000) in creating their framework concerning the three main concepts inherent in evolutionary economics: institutionalization, capabilities and learning, and change (Figure 1). The current study employs these frameworks and specifically focuses on capabilities that are framed by the realms of actions and institutions.

Figure 1. A framework for capabilities framed by actions and institutions



Source: Modified by the author from Coad & Cullen (2006), Figure 1. A Skeletal Framework, p. 349.

Capabilities represent scripts that guide the activities of actors who operate within the domain; they provide patterned activities with the capacity to help fulfill a particular task. Capabilities link activities to the structural properties of institutions and thus act as mediators in the evolutionary process. The realms of actions and institutions themselves are evolving, not necessarily in the same direction, but their evolutionary processes are indeed inter-related (Burns and Scapens, 2000). In Figure 1, the dotted arrows represent ongoing interactions among institutions and capabilities; the dotted lines denote

interactions that are not overly deterministic. The arrows between actions and capabilities are solid; this does not signify that the relationships therein are completely deterministic, but rather that actions are observable to some degree. The interval between T_0 and T_1 provides a frame for evolutionary change when learning and change (L&C) processes take place (Coad and Cullen, 2006). Some of these L&C processes are dynamic capabilities that transform operational capabilities (Teece *et al.*, 1997). Dynamic capabilities include processes that act in the following ways: (1) to identify the need or opportunity for change, (2) to formulate a response to such a need or opportunity, and (3) to implement a course of action (Helfat *et al.*, 2007). However, it is important to remember that not all dynamic capabilities perform all three functions (Helfat *et al.*, 2007). Even though, conceptually, the dynamic capabilities used to identify needs and formulate and implement responses can be distinguished within an organization, they are entangled, and their logical order can become unclear in the cycles of reformulating and reimplementing responses. Furthermore, in order to qualify as a dynamic capability rather than a mere one-time, non-recurring problem-solving event, dynamic capabilities must contain some patterned element pertaining to organizational behavior (Helfat *et al.*, 2007). Coordinating and adapting a firm's resources and the capabilities of different functions to changing environments are important managerial processes that are elements of a firm's dynamic capabilities (Helfat *et al.*, 2007).

The function of management accounting itself can be considered to be a collection of underlying routines and capabilities that evolve and change over time (Burns and Scapens, 2000; Grant, 2005; Coad and Cullen, 2006; Henri, 2006). In management accounting, capabilities might include routines for inter-organizational budgeting and performance measurement systems, target costing, kaizen (i.e., continuous improvement), value-chain analysis, activity-based costing, and open-book accounting (Fujimoto, 1999; Coad and Cullen, 2006). Some of these underlying capabilities are dynamic, whereas others are ordinary capabilities used to perform particular tasks. Target costing is considered a broad dynamic capability, as it helps actors identify, formulate, and implement changes.

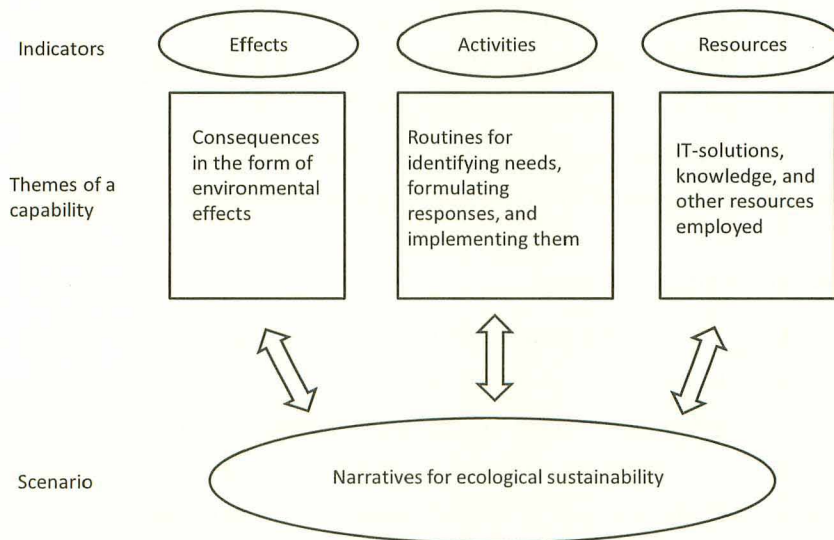
Initial pressures for ecological sustainability are often imposed by external institutions, both national and international. In addition, within an organization, there are also many employees and managers who are sincerely concerned about the state of global ecosystems. These concerns produce normative pressures related to sustainability. Since pressures for ecological sustainability will not abate, firms are developing dynamic capabilities to enable them to become more ecologically sustainable. The selection of a

“new” accounting system to incorporate ecological factors—or, rather, a path to develop it—is both deliberate and motivated by concerns about information demands and control problems. However, the selection of a new system is also influenced by other, broader institutions, including those that are extra-organizational (Burns and Scapens, 2000). Next, I introduce and discuss an account of a capability.

2.1 An account of a capability for ecological sustainability

Describing a capability or routine is not easy, as only actions are observable (Burns and Scapens, 2000). In addition, the performance of capabilities is relative, and can be followed by observing some key indicators of capacity. Details vary over time, especially as a capability develops. The current study makes use of the methodology of Mouritsen *et al.* (2001) to discuss an account of a capability. The account aims to visualize a capability for ecological sustainability through narratives that tell the story of a firm that is becoming ecologically sustainable. The account can be divided into at least three parts (Figure 2). First, there are indicators that help to outline the effects, activities, and resources involved. The indicators help describe the technical fitness of a capability, which in turn refers to how effectively a capability performs its intended function (Helfat *et al.*, 2007). Second, there are statements about themes related to capability that are used to identify a

Figure 2. Account of a capability for ecological sustainability.



Source: Created by the author based on Mouritsen *et al.* (2001), Figure 4. The idea of the intellectual account, p. 745.

set of challenges in eco-design and environmental management. The statements make the effects, activities, and resources therein more tangible, thus allowing them to be contextually aligned with the challenges the firm faces.

Third, there is a scenario that combines numbers and themes in a composition designed to illustrate the development of a firm's resources (Mouritsen *et al.*, 2001). It takes the form of a narrative in that it describes the aims for ecological sustainability and a firm's skill at certain tasks. This narrative helps describe a firm's evolutionary fitness with regard to its capabilities. Here, "evolutionary fitness" refers to how well a capability contributes to survival in the external selection environment (Helfat *et al.*, 2007).

Together, these three elements create an account of the capability, as it cannot be adequately understood in the absence of indicators, themes, and narration. Indicators and themes are only part of the description; more important is the narration used to describe the purposefulness of a capability. Combined, they describe why a firm—or, in this case, target costing—is capable of fulfilling ecological sustainability goals. For example, in 2008, Toyota held an environmental forum that focused on the realization of a low-carbon society. Toyota described an action plan by which it would contribute to the creation of this low-carbon society; it involved research and development (R&D) activities, manufacturing, and social contribution programs. Those activities, related to the aim of developing next-generation batteries for electric vehicles (EV), are a part of a wider context that contributes to the realization of a low-carbon society. This simple example shows how the narrative and purpose (aspirations to a low-carbon society) are connected to the indicators (R&D activities, manufacturing, and social contribution programs) and the theme of a capability (battery production for EVs). It shows how the firm has the capacity required to achieve the chosen purpose. The following section presents a case wherein eco-design, as part of target-costing systems in Toyota, is evaluated.

3. Eco-target costing in Toyota

Target costing is a Japanese management accounting mechanism that focuses on managing development and design processes (e.g., Monden, 1995; Cooper and Slagmulder, 1997). Toyota is the best-documented case of target costing; it is also a company committed to creating environmentally conscious products that exceed compliance with current environmental laws. An analysis of Toyota's case can illustrate how target costing systems have evolved toward ecological sustainability.

I conducted interviews with members and former members of Toyota and also studied

materials, such as sustainability reports, published by the company between 2005 and 2009. One important source was a lecture series on target costing held by a former Toyota employee. I focused on the patterned actions that alter other processes and increase the capacity for sustainability within the context of target costing.

3.1 The formalizing phase of eco-target costing

Kiichiro Toyoda is considered a key figure in developing Toyota's cost management and target cost systems in the 1930s. However, more commonly, it is thought that target costing emerged in the 1960s, and that the practice was institutionalized by the mid-1970s (Okano and Suzuki, 2007). In either case, the formalization of target costing has been a long process, and the systems are still evolving. Many individual employees, managers, and researchers have contributed to the evolution of target costing.

Environmental concerns also started relatively early. To respond to pollution from car exhaust in the 1960s, the Japanese government pioneered environmental regulation by setting strict restrictions on exhausts. This can be considered the start of the development of environmental capabilities in Toyota. This was followed by the production of the catalytic converter in 1972 and compliance with the Muskie Act in 1975. The late 1970s were plagued by oil crises; Toyota endured them better than its competitors to the extent that other firms sought to replicate Toyota's production management capabilities. Thus, Toyota has a great deal of experience with the social emergencies that have created demand for change, and has successfully adapted dynamic capabilities. Toyota has stressed that "tomorrow will be better than today" (Osono *et al.*, 2008). This corporate philosophy influences target costing and kaizen activities to find new paths to reduce costs, waste, burden on workers, and, to an ever-increasing degree, to reduce the impact on the environment. The philosophy has thus found new interpretations. The commitment to change requires a belief in a better future and a vision of how the company can realize its environmental goals.

In 1993, Toyota launched its first environmental action plan. In May 1996, that plan was revised and reissued in its second incarnation. The fourth version of the action plan⁵⁾ stresses the following environmental concerns:

1. Energy/global warming
2. Recycling of resources
3. Substances of concern
4. Atmosphere quality

These themes point to areas that Toyota considers critical to its environmental strategy; they also specify the directions in which its capabilities should be taken. In addition, the long-term timeframe involved provides the opportunity to strengthen the requisite capabilities. The starting point for eco-design is an increased awareness of environmental challenges in the marketplace, in the business environment, and among employees inside the company. New product concepts, such as electric or hybrid vehicles, might be suggested in this stage, as might the “greening” of existing products.

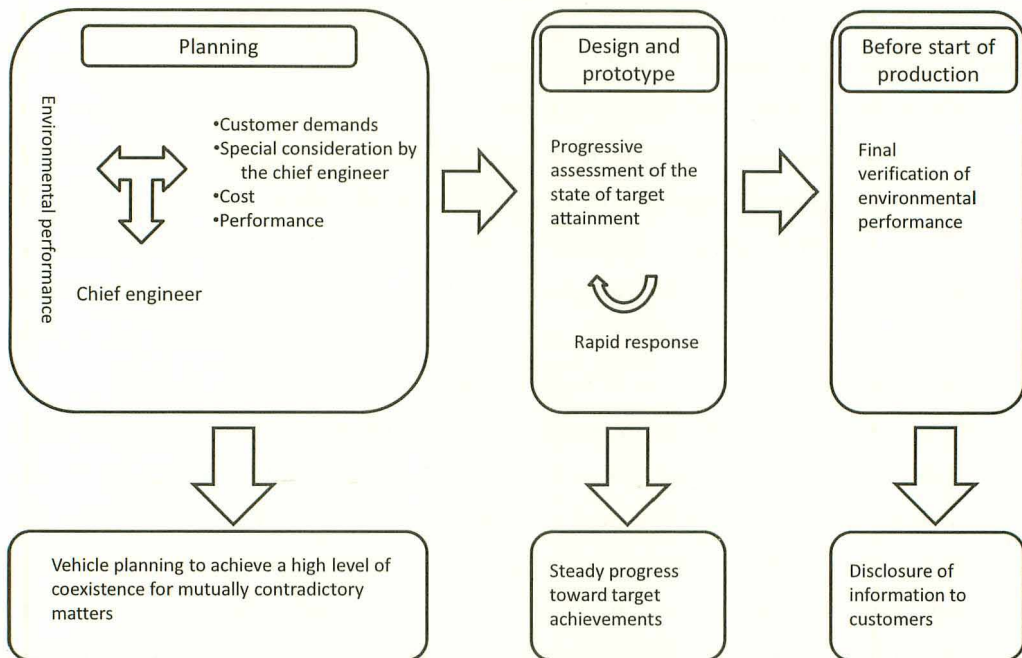
Target costs are set after assessing a firm’s capabilities for design and manufacturing to determine what it can achieve. After setting target costs, the firm can initiate the design phase, which must happen within the parameters of the determined target costs.

3.2 Eco-design activities in target costing

At the heart of Toyota’s product development is the chief engineer (*shusa*), who is responsible for the entire development of a new product—and sometimes for the product itself throughout the whole of its lifecycle (Cooper and Slagmulder, 1997). A chief engineer is supported by a cross-functional design team that brings together the different ideas and concepts needed to design the product. There is always a certain degree of prioritization that occurs, although there is constant mindfulness of the direction that environmental actions should take (for example, toward better recyclability or fuel efficiency). Improvement of performance in all dimensions can never occur simultaneously; there are always trade-offs, and the chief engineer’s actions bear a crucial role in determining the optimal combination of performance emphases from among the available choices.

As a part of its target costing, Toyota employs the Eco-vehicle assessment system (Eco-VAS) to strengthen the environmental performance of its vehicles. Eco-VAS can be roughly divided into three stages: planning, design, and prototype. All three stages occur before production begins (Figure 3). A computer network that comprises part of Eco-VAS allows a chief engineer or project leader to access an environmental database from a personal computer and determine the status of target achievements. Under Eco-VAS, the chief engineer, together with the design team, identifies the environmental impact of a proposed product; such information makes it possible to assess, through proxies, fuel efficiency, emissions, noise, volumes of greenhouse gases and air pollutants emitted, materials consumed, vehicle-recovery rates, and volumes of substances used throughout the lifecycle. A chief engineer continually confirms results and obtains feedback during the entire development process, as well as during production, use, and disposal.

Figure 3. Eco-vehicle assessment system as operational flow.



Source: Created by the author based on the overview of Eco-VAS on the website.
(http://www.toyota-global.com/sustainability/environmental_responsibility/automobile_recycling/design_for_recycling/overview_of_eco-vas.html)

The planning stage incorporates information regarding customer demands, environmental targets, technical specifications, costs, and performance; these requirements and criteria are set while the concept of the planned product is developed. After establishment of the desired product as a concept that possesses these specifications, the design process begins. Design engineers draw the parts and components using 3D-CAD and virtual production simulations to meet target costs while ensuring the required level of quality. From the perspective of eco-target costing, the aim is to determine the part-specific costs and environmental concerns that are to be incorporated into and considered during product design. To reduce the environmental impact, designers and engineers carry out the following activities for new models:

- Adopting raw materials with less environmental impact
- Adopting materials that are easy to recycle
- Adopting structures to promote the use of lightweight parts
- Developing methods that support low running costs
- Saving energy use in manufacturing

- Controlling toxic and harmful substances in manufacturing

Target costing is impossible to separate from its engineering character. One interviewee expressed the opinion that “target costing is, in essence, an engineering capability,” which covers technological, cost and environmental information. For example, currently, substituting plastic parts for metal parts has several positive effects for reducing costs and environmental impact. Most importantly, plastic parts’ ecological footprint is smaller than that of metal parts, and they reduce the overall weight of a vehicle, which improves fuel efficiency. Technological advancements in plastics have led to the development of plastics that have many of the properties of metals. Consequently, many parts previously made of metal can now be made of plastic.

Each time design engineers draw a part in the development process, cost information is calculated from the database and attached to the part to verify whether the “target cost” is achieved. Meanwhile, the production engineering division prepares the production lines. It fixes the “standard time” for producing both parts and the whole vehicle. The weekly quality control circles (QC circles) analyze received information and attempt to find solutions to problems. QC circles are root activities that create the foundation of dynamic capabilities to formulate and implement solutions to the problems identified by customer service. The targets and achievements of QC circles are discussed in weekly meetings. The discussed matters depend on the participants, but environmental, cost, and quality issues are discussed with various professionals.

Toyota employs the following environmental and disposal costs: storage fees, recovering costs, transportation costs, costs of setting up recycling platforms, burning costs, environmental protection costs, detoxification costs, landfill costs, and environmental investment costs. The routines of QC circles enable smooth interactions between the functions of cost management and designing. These routines include gathering and processing information as well as linking customer demands with engineering design choices. As Burns and Scapens (2000) described, in a certain manner, institutions are “taken-for-granted assumptions” that are outcome of social actions. In this sense, many of the above activities for eco-design are already institutionalized as these activities have already become well-established thoughts and routines aimed to reduce environmental impact. Cost, time, quality, and environmental targets set important limits on design activity. Toyota is improving its carbon accounting system for its operations and products since CO₂ is now the most widely used metric for eco-efficiency. The advantage of CO₂ as a proxy for environmental performance is that it is relevant to fuel economy as well as to reduce redundant

transportation between assembly and suppliers. In other words, this proxy can be used to assess a variety of effects. For an example of engineering activity, in the case of hybrid Lexus sedans, design of the driving control system was guided by this proxy. Coordinated control of the front and rear wheels' regenerative and hydraulic braking increases the energy recovery rate during deceleration and braking. This cuts fuel consumption and helps to significantly reduce CO₂ emissions.

Volatile organic compounds (VOCs) are another commonly used proxy for environmental performance. VOCs are one of the causes of photochemical oxidants. Toyota takes various steps to reduce VOC emissions from its vehicle body painting lines, including introducing water-borne paints for the topcoat and strengthening measures to recover used cleaning solvents. In 2007, Toyota managed to reduce VOC emissions to 20g/m² per unit of painted area on all vehicle body by using water-borne paints for intermediate coats and top coats at the Takaoka Plant No. 1.⁶⁾ In addition, redesigning the way vehicles are painted can significantly reduce the use of water and energy, because the paint shop is Toyota's largest consumer of energy and water. One way this is achieved is to reduce shop floor space by shrinking distances between machines. The smaller the machines are, and the smaller the gaps between the vehicles in line are, the lesser the energy and water that is required. In Toyota's product design approach, a chief engineer organizes design engineers who belong to product engineering design sections to realize their concepts of a new or revised vehicle. Moreover, this is concurrent or simultaneous engineering, because first-tier suppliers, production engineers, and the production division participate in this design phase. Concurrent engineering has a large role in recycling design. It is often supervisor-level employees in production (group leaders and section leaders) who assess and verify vehicle structures and parts in order to make proposals to product managers about modifying part designs and vehicle structures.

In January 2005, the Law Concerning Recycling Measures for End-of-Life Vehicles (also called the "Automobile Recycling Law") was enacted in Japan. This law mandates the collection and recycling/recovery of various elements generated from end-of-life vehicles. In response to the law, Toyota has had to formulate and implement new recycling procedures. For example, Toyota has modified the material composition of the instrument panel in the new Crown, changing the covering and soft layer from urethane to polypropylene, thus using the same material for both the covering/soft layer and the base.⁷⁾ This improves the recyclability of the instrument panel. Additionally, the use of recycled material produced from bumpers (recycled polypropylene) recovered from dealers has

been extended from engine compartment liners and floor covers to toolboxes in Crown models. Recycling design has also led to collaboration with rivals. In 2007, three inter-organization study meetings were held by the ASR Recycling TH Team. The meetings consisted of members of Toyota, Honda, Daihatsu, and five other companies, who met to promote methods and tools for recovering copper and hybrid vehicle battery packs from end-of-life vehicles. These meetings are essential to ensuring complete resource recovery⁸⁾ in the industry.

Some of the above examples are detected in the production or recycling stages; then, ideas for improvements are conveyed and employed in new products. Although strictly speaking, target costing and kaizen take place in different stages of the product cycle, knowledge also flows from the kaizen stage to target costing, since the same people who search for kaizen opportunities also take part in meetings about developing new products. Knowledge transfer among members takes place commonly in meetings (quality, cost, etc.), and this flow of meetings creates a knowledge spiral to improve design capabilities. This knowledge spiral enhances a firm's capabilities by upgrading knowledge-based competence, as human workers' capacity to employ other resources depends on their knowledge (Nonaka and Takeuchi, 1995). In particular, during the last 15 years, development cycles of new products have become shorter and knowledge cycles, from kaizen activities for older models to target costing of new models, have become more intensive. Toyota has also taken actions to improve this knowledge spiral. It was improved in the late 1990s when "team leader" was eliminated as a job title and replaced by "expert," a position with no management function. Experts act as intermediaries between the shop floor and the engineers from the production engineering division, who are ultimately responsible for formulating change. Additionally, as a part of their usual activities, experts develop mechanical solutions to bottlenecks in production lines and discuss problems with group leaders and chief leaders. In this stage, many tools are tested, and, if they are successful, they are gradually institutionalized. The emphasis on kaizen includes the following activities: paying attention to quality and productivity, gradually acquiring kaizen and problem-solving ability, perceiving the workplace as one's own, and understanding the meaning of kaizen. This results in higher productivity, improved quality, and lower costs (Fujimoto, 1999). Since the early 1990s, kaizen has focused on saving materials and energy as well as humanizing working conditions. Therefore, it has grown into a practice for environmental management. Some gains in energy and improvements in working conditions are obtained by better use of floor space.

In Japanese culture, informal meetings have an important role in problem-solving. Information from various sources is processed at meetings, which can be more formal during the day or informal after work at pubs. Informal meetings have a vital role in the operation of target costing systems in Japanese companies. Written documents and manuals are important; however, the exchange of tacit and oral knowledge among employees often plays an even more critical role. Knowledge about failures in reaching targets is often communicated among employees in the form of narrative knowledge (stories). For example, engineers who were involved in making the Toyota Prius, a hybrid car, tell the story of the first trial with a prototype in the early 1990s: the car did not start; at the next trial, the car could only go 100 meters. Stories are then connected to show how obstacles have been overcome in the past and how current problems will be solved. Such stories act as encouragement, and the concept of advancing through persistent effort becomes more concrete among employees. In addition, these exchanged stories help employees avoid similar mistakes on current design projects. The stories told in meetings link former experiences with current challenges and create a knowledge spiral from the past to the present.

One important task of a chief engineer is to act as an interface between suppliers. Cooperation to save fuel costs and reduce CO₂ emissions is one aspect of meeting with suppliers. In the 1990s, there was not a great deal of emphasis on energy saving, but rapid energy price hikes changed this in the 2000s. When oil prices increased tenfold between the 1990s and 2008, it became necessary to develop dynamic capabilities to reorganize the logistics between Toyota and its suppliers. Another important issue for concurrent engineering with suppliers has been the attempt to phase out environmentally harmful substances. For example, Toyota's project to eliminate substances of concern (SOCs), including lead, mercury, cadmium, and hexavalent chromium.⁹⁾ Parts and component suppliers were required to investigate and declare the chemical composition of all their products. If SOCs were found, they were asked to eliminate the use of SOCs in components and switch to alternative materials. A significant challenge in this project was to ensure that suppliers adequately understood its purpose. At first, there were meetings with suppliers and an open forum to share knowledge about SOCs and the "SOC-Free Project." The purpose was to identify the problem and make all participants aware of the challenge. Toyota's engineers then worked with the suppliers to formulate responses to the challenges of SOCs and implement the responses by finding alternative materials. Another challenge was checking the large number of parts and materials for compliance; in other

words, Toyota needed a mechanism for accountability. Therefore, Toyota created an additional team to meet the verification deadline for testing all the samples. The team solved the problem by acquiring special X-ray equipment capable of detecting the presence of SOCs to ensure that parts and materials were free of such substances. The team and X-ray equipment together create a verification capability to persuade suppliers to follow the SOC-free policy. Even though the verification capability would not be 100% accurate, the psychological impact is enough to prevent intentional opportunism among suppliers. The project reached its goal of 100% SOC-free parts and materials and, after creating trust among suppliers, Toyota continues to conduct random checks. Additionally, when vehicles are redesigned, all new parts and materials are checked for SOCs.

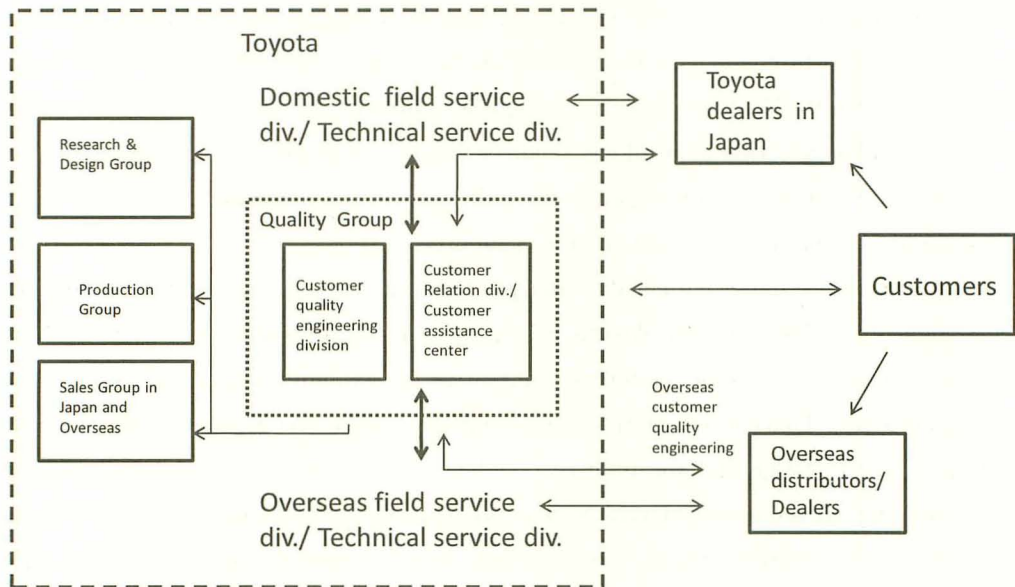
Next, I examine the Toyota customer capabilities that identify needs and problems that customers have had with vehicles. Information from customer experiences are gathered and delivered to designers who work on new models.

3.3 After-sales and customer capabilities

Capabilities in customer service are important in two ways. First, they identify customer needs and problems with vehicles. Second, the customer service personnel have an important role in formulating responses to customer needs in design meetings. Toyota calls this system "customer-in," which refers to the system through which customer information is directly linked to production to incorporate customer desires into new vehicles. Toyota aims to improve customer satisfaction through initiatives in all areas of its business activities, including development, purchasing, production, sales, and after-sales services throughout the entire corporation. Figure 4 illustrates the customer response system.

The quality group consists of the customer quality engineering division and the customer relation division, which has a customer assistance center. The quality group receives information from dealers, customers, and field service divisions and converts it into concrete suggestions for the R&D and production groups. This quality group learns from customers' problems and desires and thus forms the heart of Toyota's customer capability. The suggestions made to the production group are combined with knowledge from floor workers and their kaizen activities. Effective procedures for recycling and disposal are necessarily designed at an early stage, in part through collaboration with dealers and customers.

Figure 4. Toyota's customer response system



Source: Created by the author based on information in Toyota Sustainability Report 2008, page 56.

4. Discussion

In this study, I argued that change toward sustainability could be competently explained in terms of dynamic capabilities. In support of this argument, I studied the case of Toyota and explicated how their target-costing systems have led to the institutionalization of environmental practices.

The process by which environmental practices have become institutionalized was initiated by a combination of factors, including environmental regulations to save material and energy costs, and normative pressures, such as those related to social interactions between employees and society. Dynamic capabilities identify the challenges imposed by these pressures, and the firm involved then formulates and implements appropriate responses (Helfat *et al.*, 2007). Toyota's foundation of dynamic capabilities relating to target costing is especially diverse in QC meetings, where problems, opportunities, and challenges are discussed weekly. At Toyota, eco-design activities have become routine procedures and "shared taken-for-granted assumptions" (Burns and Scapens, 2000). When we view target costing as a collection of underlying capabilities built on the patterned actions of knowledge-based people, we can argue that the capacity for ecological sustainability has improved. This improved capacity can be assessed by depicting an

account of eco-target costing capability. The account has the following elements: a narrative describing the purpose of the capability, themes of capabilities that connect indicators with ecological challenges, and indicators that contain a number of activities, resources, and effects. The themes of the capabilities represent statements that connect indicators to challenges; this also allows them be labeled to identify ecological challenges and formulate and implement responses to challenges. In the following, I will summarize the account of dynamic eco-target costing capability.

In an account, a narrative clarifies the purpose and themes that connect indicators with challenges. For example, Toyota has clarified its vision, and the concept of low-carbon economy has become an integral narrative for explaining a variety of environmental activities. This concept merges various environmental trends, such as worries concerning climate change and the high cost of fossil fuels. Although customers' reasons for preferring an eco-designed vehicle can range from ecological and ethical beliefs to purely financial considerations, target-costing systems identify preferences and submerge them into the vision of a low-consumption recyclable vehicle. The capabilities to identify ecological trends, challenges, and opportunities are based on capabilities found in management, design, and customer service. Top management personnel play vital roles in identifying many broad environmental trends and challenges; to this end, they hold meetings with policy-makers and other stakeholders to identify pollution sources and the main trends thereof. Nevertheless, the role of top management should not be overly emphasized, because the various teams of designers identify many trends on their own. Another source of information by which a firm can identify trends and opportunities is customer service. The capabilities that allow customer service to connect with product design are embodied in the customer relation division, which hosts activities that connect customers and dealers with designers.

Capabilities for formulating and implementing a response are often inseparable and overlap, especially when implementation begins while formulation is still in progress; thus, it is relevant to discuss these two areas together. Information gathered from customers and dealers is considered in in-house meetings that involve managers and engineers, with the goal of formulating responses to opportunities and problems. A flow of small changes and improvements takes place in QC circles and at cost meetings. In addition, kaizen activities produce knowledge that is incorporated into the product design process through meetings between designers and production engineers. The process is gradual: in each meeting, a small change takes a place; it, together with others, eventually gives

Table 1. An account of dynamic capabilities of eco-target costing.

Narrative for ecological sustainability The vision is to contribute to the development of a low-carbon recycling-based society through innovative environmental technologies. Toyota's challenge is to achieve zero emissions throughout all areas of business activities. Toyota is working toward this by developing products with top-level environmental performance, pursuing production activities that do not generate waste, and implementing preventive measures.			
Indicators Themes	Number of activities	Number of resources	Number of effects
Capabilities for identification	No. of meetings between dealers and design engineers No. of product concept meetings between designers and executives	No. of designers Investment in environmental education Dealer networks	Received feedback Total customer satisfaction Rewards
Capabilities for formulation and implementation	No. of meetings on quality, control, and costs No. of subthemes for eco-design	No. of databases No. of eco-designers No. of meetings on environmental problems	CO ₂ emissions Reduction of weight of components, used water, eco-efficiency ratios Targets for subthemes

Source: Created by the author.

rise to innovation. At the corporate level, CO₂ emissions and water consumption are useful proxies for mapping advancements in environmental performance. Subthemes pertaining to eco-design include narrow engineering and design capabilities, such as engine improvements, plasticizing parts to reduce weight, improving recyclability, using more durable materials, and controlling for SOCs and other harmful substances. Accordingly, subthemes can be assessed using suitable proxies, such as fuel consumption, weight reduction, and recycling ratios. Databases serve as strategic resources that provide a chief engineer with the capacity to supervise development work through proxies and other metrics.

Although target costing is a broad organizational capability, the importance of retaining a competent chief engineer for a firm cannot be overstated. The intentional agency of a chief engineer directs the evolution of a firm's target costing systems. The actions of the chief engineer can easily become routine and incorporated into the design and production of later product models. Solutions to reduce environmental impact are often not

optimal from a financial or ecological standpoint, but they represent compromises between conflicting factors and routines. A chief engineer can decide the extent to which ecological concerns are reflected in the design process; often, his or her decisions later serve as precedents and become part of a repeated pattern. Of course, considerable confusion and resistance can occur while solutions are being formulated and implemented, and the chief engineer must also address these conditions.

Moreover, the role of a chief engineer who works with suppliers has grown as an increasing number of parts and components are outsourced, and now both environmental and social policies must be sufficiently outlined to suppliers. In practice, the chief engineer can change the types of solutions that are created, principally by inviting process supplier representatives and people from different functions into the decision-making. Meetings involving this diversity of functions and individuals are a source of cross-functional dynamic capabilities. However, dynamic capabilities are costly to imitate and maintain. For instance, Toyota hosts a large numbers of meetings; in fact, engineers there may have at least ten meetings per week. Such a large number of meetings can tie up considerable (and expensive) human resources. Nevertheless, in today's business world, possessing dynamic eco-design capabilities has become indispensable, not only in terms of a firm's success but also its survival.

5. Concluding comments

The broad objective of this paper was to improve the understanding of how firms can evolve toward ecological sustainability and how management accounting assists in that change. To facilitate this understanding, this study employed the concept of capabilities. Firstly, the study developed a theoretical framework to analyze capabilities that are framed by institutions and actions. Secondly, the case study found a linkage between daily activities—such as QC circles and daily kaizen events—and target costing, thus showing that the formation of target costing is a broad dynamic capability that is evolving toward sustainability. Broad capabilities themselves are complex collections of invisible routines, and, while studying them, we must rely on activities, effects, and resources to visualize an account of eco-design capabilities related to target costing. I found support for the assertion that target costing has evolved toward sustainability, although not as much in visible structures as in the capabilities and institutions that affect actions. Finally, the study developed an account of dynamic capabilities of eco-target costing that makes it possible to analyze dynamic capabilities in detail. The account describes

dynamic capabilities for the identification, formulation, and implementation of ecologically conscious target costing. When combined, eco-design actions become gradually stabilized capabilities that produce effects that alter the assumptions shared by designers and engineers.

The current study was limited to the study of broad dynamic eco-design capabilities within the context of target costing. This is quite a limited subset of target costing; however, it is becoming increasingly relevant in a world where natural resources are scarce. Collectively, capabilities represent a research field that has lacked methodology, and it is my hope that this brief study inspires other researchers to study intangible capabilities further. Depending on how well researchers can access internal data pertaining to activities, resources, and effects in the future, they may be able to assess more detailed changes in capabilities over longer time periods and make it easier for managers to visualize capabilities more clearly.

Notes

- 1) Although the term "sustainability" has deep social connotations, this study focuses on *ecological* sustainability, and the term "sustainability" refers in this study refers to this definition.
- 2) However, not all routines related to accounting are valuable capabilities; some routines can even be counterproductive.
- 3) Routines are capabilities if they are valuable (rent-producing), rare, and costly to imitate (Barney 1991; Collis and Montgomery, 1998; Barney and Clark, 2007). This scarcity of rent-producing capabilities is often based on the nature of the routines that make capabilities causally ambiguous, tacit, and path-dependent (Grant, 1991).
- 4) Operational capabilities enable an organization to earn a living in the present. When a firm alters its operational capabilities, it employs dynamic capabilities in reconfiguring its other resources and capabilities. Dynamic capabilities represent the ability of an organization to purposefully create, extend, or modify its resource base (Helfat *et al.*, 2007).
- 5) The Fourth Toyota Environmental Action Plan (FY 2006-10).
- 6) See *Toyota Sustainability Report 2008*, p. 38.
- 7) See *Toyota Sustainability Report 2008*, p. 33.
- 8) Complete resource recovery refers to a process by which dismantling companies remove wiring harnesses, motors, and other copper parts before the body of vehicle is processed into raw steel. In other words, they perform complete dismantling. This results in the complete removal of all copper impurities and ensures the quality of the steel for new vehicles. See *Toyota Sustainability Report 2008*, p. 33.
- 9) See *Toyota Sustainability Report 2008*, p. 36.

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Evolving management accounting: An account of dynamic capabilities in eco-target costing

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Summary

How firms can evolve toward ecological sustainability—and how management accounting assists in that change—are pressing questions for many firms. This study explores how the practices of environmental management and eco-design are institutionalized within the context of target costing, a Japanese management accounting method. The current study employs the concept of dynamic capabilities, as framed by institutions and actions, to explicate how Toyota's target-costing method has expanded to consider ecological issues.

The case study starts by presenting connections between daily activities, such as quality circles and daily kaizen events, and target costing, thus demonstrating their impact on ecological sustainability. The study finds support that target costing has evolved toward sustainability, although not as much on the level of visible structures as on the level of the capabilities and institutions that affect actions to reduce environmental impacts. Finally, the study develops an account of dynamic capabilities for ecologically conscious target costing.