



The effect of sustainability in the adoption of technological, service, and business model innovations



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ABSTRACT

The focus of this paper is on the interplay between sustainability and the adoption of various types of innovations. Little empirical research addresses how the valuation of sustainability affects the adoption of different types of innovations. This study contributes to this research gap by presenting the explanatory sustainability factors behind horse industry operators' willingness to adopt technological, service, and business model innovations. The study was executed in Finland, where currently only a fraction of horse manure's potential is utilized and the horse industry is asking for new business models, innovations, and sustainable development. Empirical results collected through a survey of 139 Finnish horse industry operators reveals that the more an operator values economic sustainability, the more likely it is to adopt technological innovations, service innovations, and business model innovations. Moreover, a high valuation of environmental sustainability diminishes the input needed to adopt technological innovations, and the more an operator values institutional sustainability, the more likely it is to adopt business model innovations.

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1. Introduction

During the last few decades sustainability and sustainable development of organizations has received growing attention from policy-makers, industrial organizations, and academics. Many recent studies in the sustainable development discourse have examined the important connection between innovations and sustainability (cf. Qi et al., 2010; Boons and Lüdeke-Freund, 2013; Matos and Silvestre, 2013; Albort-Morant et al., 2016). Sustainable development research can be seen even in critical natural resource-intensive sectors, such as the horse industry, that have an important environmental impact (Elgåker, 2012; Elgåker et al., 2012). Thus, enhancing the adoption of innovations should be a top priority for industry operators. Establishing a new role for operators requires a broader understanding of the drivers of technological, service, and business model innovations (cf. Yang et al., 2017). Hence, firms must generate a variety of sustainability dimensions

as drivers that reflect the interests in adopting these innovations. As society has called for further investments and initiatives from organizations, educational institutions, and governments in innovative multidisciplinary approaches to resolve current sustainability challenges (Lozano et al., 2013; Almeida et al., 2013), this study explores the interplay between sustainability and the adoption of various types of innovations, namely technological, service, and business model innovations.

The horse industry today in the European Union is of increasing economic importance to all countries, and it still plays an important role even in many countries agriculture (Liljenstolpe, 2009). The horse industry plays significant role within society, even though the role of horses has largely changed from agriculture and transport uses to a leisure activity and way of living. Even though the horse industry today provides new opportunities and possibilities for alternative land use and nutrient recycling, as well as new business models for horse companies, it also faces some environmental challenges. During the past two decades, the location of horses has shifted from the countryside to urban areas, causing more sustainability and environmental challenges.

One of the bigger challenges is related to the production of horse manure. A horse produces about 20 kg of manure every day, which

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may contribute to nutrient run off (mainly nitrogen and phosphorous) (Liljenstolpe, 2009). Currently, only a small part of that manure can be used as fertilizer, especially in urban areas, due to environmental regulations. Therefore, to develop a sustainable horse industry, the problem of handling and utilizing horse manure must be solved. Many horse industry operators and stakeholders are interested in utilizing horse manure more efficiently but currently lack ways of doing so due to existing challenges (e.g., gate fees, requirements for digestate use, and attitudes and awareness). For that reason, different types of technological innovations—that are economically feasible for individual operators to invest in are arising. Service innovations are being developed, such as comprehensive service models in which an energy producer collects all the manure from stables and farms and in exchange brings litters for horse operators. Different types of business model innovations are also being developed, for example, where stable keepers co-invest in gas plants or dry digestion plants and sell the energy produced. However, little empirical research has addressed how the valuation of sustainability affects the adoption of these different types of innovation.

This study aims to address this research gap by investigating the explanatory sustainability factors behind horse industry operators' willingness to adopt technological, service, and business model innovations. The research question is as follows: how does the valuation of sustainability affect the adoption of different types of innovations, namely technological, service, and business model innovations? Empirical data for this study were collected through a survey of Finnish horse industry operators. In total, 580 questionnaires reached the informants, and 139 valid responses were received. The results of this study present the explanatory sustainability factors (economic, institutional, environmental, and social) behind the adoption of technological, service, and business model innovations. The results of this study were gathered from Finland, but we believe they can be useful in many other countries because in Europe, national differences have become less important, including in the horse industry (e.g., Liljenstolpe, 2009).

2. Adoption of innovation types

The interplay between sustainability and the adoption of different innovation types can be seen as a highly important or even necessary part of horse industry operators' activities to support the various sustainable aspects of their operations. The complexity of current sustainability and environmental challenges means that locally adapted and innovative solutions are needed for different sectors and industries (Sousa-Zomer and Miguel, 2016). Kurucz et al. (2017) have suggested that the key leadership challenge for sustainability can be understood as one of integration—the continuous alignment of multi-stakeholder intention and action with social and ecological imperatives and constraints—and addressing this challenge requires an ongoing process of reflective practice and meaning-making among relevant social actors. In their literature review of “the drivers for adoption of eco-innovation,” Bossle et al. (2016) suggested that, considering the significance of how different organizations integrate sustainability into innovation actions, it is important to question, “What are the drivers and motivation for companies' adoption of eco-innovation?” They show that, like innovation itself, eco-innovation is multi- and trans-disciplinary, which leads the use of different expressions related to same approach or subject, for example, sustainable innovations, environmental innovations, green innovations, and eco-innovations (citing Fagerberg, 2005; Santolaria et al., 2011; Boons and Lüdeke-Freund, 2013). These innovation types can include several elements, including for example technological, service, and

business model improvements. In this study, the effect of sustainability on the adoption of innovation types is explored through technological innovations, service innovations, and business model innovations. These innovation types are defined in following paragraphs.

2.1. Technological innovations

Technological innovation has been suggested to be an important solution to many sustainability challenges, including climate change, the utilization of renewable energy, and the circular economy (cf. European Commission, 2014; Long et al., 2016). The study of Sousa-Zomer and Miguel (2016) also reveals that water systems in cities throughout the world are facing immense sustainability challenges, such as water scarcity, and new sustainable technologies and innovations (together with new types of business models) are needed. As such, technological innovation will play a significant role in achieving important societal qualities, such as economic growth, improved human well-being, and sustainable development (Anadon et al., 2015; Shrivastava et al., 2016).

Technological innovation can be seen, for example, as the adoption and utilization of new technological products or solutions, related to, for example, renewable energy production. Even though there is significant potential in technological innovation, it might be challenging for technology innovation to succeed alone in the market (cf. Chesbrough, 2010; Yang et al., 2017). To deliver sustainability, technology and technological innovations in many cases need suitable business models to support their potential, and those models need to be adopted to improve sustainability on different levels. Long et al. (2016) have also recognized that adoption of technological innovation alone may not achieve optimal outcomes due to mismatches between the design of technological innovations and the context within which they are ultimately used; as such, technological adoption can be seen as a process of adaptation and appropriation. For example, climate-smart agricultural innovations at the field and farm level have the potential to achieve sustainable outcomes associated with (i.e., enhance the productivity of) agricultural land, while simultaneously reducing the risk of climate change (cf. Scherr et al., 2012; Long et al., 2016) and enhancing the utilization of renewable energy and nutrient cycling.

2.2. Service innovations

The service sector can be seen as an important and continually growing sector and the major source of economic growth (cf. Martin et al., 2016). It can be also seen as an important sector for the sustainable development of societies and businesses on different levels. Service innovations can occur in different types of industries and organizations, but compared with manufacturing organizations, service-based organizations' growth and value creation differs significantly, making service innovations very relevant from the point of view of future development (Vargo and Lusch, 2004; Martin et al., 2016).

Service innovation acts as society's engine of renewal and provides a necessary catalyst for the service sector's economic growth (Snyder et al., 2016) and for the sustainable development of societies and different industries. Traditional service innovation classifications separate radical and incremental innovations (cf. Gallouj and Weinstein, 1997) and product and process innovations (Vaux Halliday and Trott, 2010; Snyder et al., 2016). More recent classifications propose that service innovations differ from traditional innovation perspectives in aspects such as the customer's changing role and new business models (cf. Hsieh et al., 2013; Snyder et al., 2016). The models of Ford et al. (2014) also reveal that environmental regulatory burdens relate strongly to product and service

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