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The Co-Creation of Multi-Agent Social Innovations: A Bridge Between Service and Social Innovation Research.

Paul Windrum^a, Doris Schartinger^b, Luis Rubalcaba^c, Faïz Gallouj^d and Marja Toivonen^e,

*^a Nottingham University Business School
Jubilee Campus, Nottingham, NG8 1BB, UK*

*^b AIT Austrian Institute of Technology GmbH, Vienna,
Donau-City-Straße 1, 1220 Wien, Austria.*

*^c University of Alcala
Plaza de la Victoria 2, 28802, Alcalá de Henares, Madrid, Spain*

*^d University of Lille 1,
59655 Villeneuve d'Ascq. France*

*^e VTT Technical Research Centre of Finland
Tekniikantie 2, 02044 Espoo, Finland*

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Abstract

Purpose

The research fields of service innovation and social innovation have, until now, been largely disconnected. At the most basic level, a great many social innovations are services, often public sector services with social entrepreneurs organizing and delivering service innovations. As well as this overlap in the focus of research, scholars in both research fields address socioeconomic concerns using multidisciplinary perspectives. This paper provides a framework that can bridge the two research fields.

Design/methodology

Inter-linkages between service and social innovation are shown by identifying research areas in which both find a joint heuristic field. This approach has been illustrated in a set of case studies in the health sector in Europe

Findings

The bridge between social innovation and service innovation research can be built when social innovation is examined through a multi-agent framework. We focus on social innovations where the co-creation of novel services is guided by the prominent position taken by citizens, social entrepreneurs or third sector organizations (NGOs or charities) in the innovation process. Of particular interest are the ways in which the interests of individual users and citizens are 'represented' by third sector organizations. Our case study of the Austrian nationwide public access defibrillation (ANPAD) programme provides an exemplar of the process of co-creation by which this social innovation was developed, implemented, and sustained. Here the Austrian Red Cross acted on behalf of citizens, organizing an innovation network capable of creating both the demand and the supply side of a sustainable market for the production and safe application of portable automated external defibrillators (AEDs) in Austria. This process involved, first, raising public awareness of the need for portable defibrillators and acting as a user representative when inducing changes in the design of portable AEDs. Later, there was the institutionalization of AED training in every first aid training in Austria, work with local manufacturers to produce this device, and with large user organizations to install AEDs on their premises.

Originality/value

The paper develops multi-agent model of innovation that enables one to synthesize key concepts in social and service innovation literatures and, thereby, examine the dynamics of invention and diffusion of social innovations.

Keywords: co-creation, social innovation, service innovation, third sector.

1. INTRODUCTION

With the growth of private and public sector services in developed and developing economies - around 67% of global value-added is in services (The World Bank Group, 2015) - service innovations and social innovations are increasingly overlapping.¹ Notable service sectors in which social innovations occur are education (e.g. charter schools), health (e.g. patient-centered models of health care), tourism (e.g. rural development initiatives), finance (e.g. crowdfunding, microfinance) and social services (e.g. social entrepreneurship).

It is surprising, given this overlap, that research on social and service innovation has proceeded largely as parallel research fields, rarely crossing. This is perhaps as much due to the different backgrounds of the researchers involved in these research fields, as it is differences in content (see recent reviews by Pol and Ville, 2009; Tepsie, 2012; Howaldt and Schwarz, 2010; Djellal and Gallouj, 2013; Franz et al., 2012; Reinstaller, 2013; Van der Have and Rubalcaba, 2013). Social innovation scholars tend to draw on sociology and on political science, while services innovation scholars tend to draw on the neo-Schumpeterian economics tradition.

This paper builds a bridge between social and service innovation research using the concept of multi-agent *co-creation*². In the simplest case, there are two agents involved, such as the consumer and the firm. In other cases, co-creation may involve multiple agents, possibly from third sector organizations, public sector providers and policymakers, as well as consumers and firms. We operationalize the co-creation concept through a multi-agent framework. This captures the key aspects of the process of co-creation; i.e. the co-development, implementation and sustaining of social innovations. This builds on the Windrum and García-Goñi (2008) multi-agent framework, and is applied to social innovations for the first time.

Social innovations tackle pressing social, economic and environmental challenges facing society. They often involve multi-agent and multilateral networks, organized to design, deliver and sustain new services. Social innovations are increasingly professionally oriented. Third sector organizations, operating in social services and other public sector services such as health and education, are developing a wider range of solutions to meet social challenges.³ Amongst these third sector organizations, voluntary, community and social enterprises (VCSEs) have attracted particular attention amongst policy makers and researchers. It is argued that social entrepreneurs are better able to deliver more effective social services because they have specialist knowledge of the client's needs, are able to develop new services that solve the very specific problems of citizens (in contrast to public bureaucracies which target an 'average' individual), and are concerned with the ethical and social impacts of their social innovations (Mulgan et al., 2007; OECD, 2010; European Commission, 2010).

¹ We are not suggesting that service and social innovations are synonymous. Rather, the two are increasing overlapping categories. Social innovations may occur in manufacturing sectors, or in agricultural sectors. On the other hand, innovations in private service sectors may be solely driven by profit without consideration of their (possibly negative) impacts on social welfare and the environment. There may also be certain social innovations (e.g. new social practices) that do not lead to any form of new or improved service product.

² In this paper, the concept of 'co-creation' is linked to innovation – not to the value generation between the provider and customer. Thus, it differs from the application of the concept in service-dominant logic (Vargo and Lusch, 2008) and in some other service marketing theories (Grönroos, 2011).

³ The not-for-profit third sector includes unincorporated and voluntary associations, trusts, charities, co-operatives, foundations, and not-for-profit voluntary, community and social enterprises (Windrum 2014).

An example, recently published in this journal, is the Intesa Sanpaolo in Italy (Altuna et al., 2015) that integrates CSR within the business strategy and generates new banking services.

Social innovations commonly involve the development of new or improved services for society. We focus on social innovations where co-creation is guided by the prominent position taken by a third sector organization in the innovation process. Of particular interest are the ways in which the interests of individual users and citizens are ‘represented’ by third sector organizations. This issue was raised and extensively discussed within innovation sociology (Rabeharisoa and Callon, 2004). The case study of the Austrian nationwide public access defibrillation (ANPAD) programme presented in this paper offers an exemplar of the process of co-creation. Here the Austrian Red Cross (ARC) took the lead role in organizing a co-creation network, acting on behalf of citizens and organizing an innovation network capable of creating both the demand and the supply side of a sustainable market for the production and safe application of portable automated external defibrillators (AEDs) by laypeople. This process involved, first, a raising of awareness regarding the need for portable defibrillators, amongst the general public and also politicians. The ARC acted as a representative of users in its dealings with medical professionals, politicians, and private sector businesses. It organized AED training in every first aid training in Austria, worked with research hospitals engaged in establishing an evidence base, worked with firms located in Austria to produce AED devices, and with large businesses to have portable AEDs installed on their premises.

The remainder of this paper is organized as follows. Section 2 identifies overlapping areas within the existing social innovation and service innovation literatures. It identifies a common domain of interest, and how these fields of research can usefully be integrated. Section 3 examines the concept of co-creation, which usefully brings together the different strands of literature discussed in section 2. Building on this, section 4 details the theoretical multi-agent co-creation framework that will be used to analyse the dynamics of co-creation in social innovations. The framework is applied, in section 5, to the portable AED case study. This opens up a discussion of the co-creation process by the Austrian Red Cross within the innovation acted to create a sustainable multi-agent network which was able to successfully develop, implement and sustain this social innovation. The analyses highlights the ways in sustainability is shaped though changes in the competences and preferences (including mental models) of key social agents.

2. SOCIAL AND SERVICE INNOVATION

Social innovation is ‘social’ both in its outcome and in its process. The stakeholders involved in a social innovation seek to address a societal challenge, based on new ways of empowering citizens and establishing new social relationships. This requires changes in the design, organisation and delivery of these services / products and the relationships of organizations involved in the supply and regulation of these services / products (Pol and Ville, 2009; Ruiz-Viñals, 2013; Hochgerner, 2013; Howaldt and Jacobsen, 2010).

The OECD LEED Forum on Social Innovation (2000) and the European Commission (2011) highlighted the link between services and social innovation. Social innovators seek to develop new services that improve the quality of life of individuals and communities in labour market integration, social inclusion, health care, education, resource efficiency and environmental challenges. Similarly, they have emphasized improvement in quality of life

through the new services which result from social innovations and particularly addressed the emergence of new competencies, jobs, and forms of participation in services innovation.

Yet, to date, the service and social innovation literatures remain separate sub-fields (see the reviews of Tepsie, 2012; Howaldt and Schwarz, 2010; Harrisson et al., 2010; Djellal and Gallouj, 2013; and Reinstaller 2013). The Tepsie project sought to integrate a discussion of changing social norms and practices within the social innovation literature, with the innovation concepts developed by neo-Schumpeterian economists. In so doing, this shifts the focus towards social innovation as the introduction of *novelty* within a socio-economic system, taking the form of new services which are new to the sector and a geographical region / country. Successful *implementation* of novelty is required if *social needs* are to be met. Closely related here is the notion of *effectiveness*. Social needs are better met when social innovations are more effective than pre-existing service solutions.

Seen in this light, social innovation may be viewed as a broadening of the innovation concept to include social change produced by social action. The social innovation concept has also been developed to connect and synthesise overlapping concepts. These include regional and urban transformations, and the study of local innovation (Moulaert et al., 2005, 2013), virtual users and user-created content (Dahan and Hauser, 2001), innovation communities (Tuomi, 2002), soft innovation and design innovation (Stoneman, 2010 and Brown and Wyatt 2010), eco-innovations (Stahel, 2006), and organizational change (Poole and Van de Ven, 2004).

From a service innovation perspective, one can identify three areas where service innovation and social innovation are strongly related:

1. *(New or improved) services are outcomes of social innovation.* Social innovation is often an innovation *in* services and a service innovation (Djellal and Gallouj, 2013). Social innovations lead to new or modified services which improve the quality of life of individuals and communities. Microfinance is the quintessential example. It is the provision of loans, savings, insurance, and other financial services to poor people who lack access to the conventional financial system. Other examples include new patient-centered approaches to the treatment of chronic diseases, new pedagogic techniques in education, smart cities initiatives, new rural tourism initiatives, and, increasingly, new solutions for tackling sustainability.
2. *User-led innovation.* The role of users in the innovation process has attracted much attention, in both the social and service innovation literatures (Sundbo and Toivonen, 2011). Citizens are not simply passive consumers of services but active participants, who co-create, trial and implement innovations and, through actively using these innovations, help to diffuse service innovations. Driven by a desire to ‘solve their own problems’, citizens innovate in ways that deliver better services and social welfare. While the involvement of society in innovation processes is not new (see, for example, von Hippel 1986 on user-led innovation), the modes and levels of potential engagement have drastically increased over the last two decades. Globalization and digitalization have had a major impact on society, allowing consumers, producers, innovators and investors the possibility to connect and act, empowering individuals to participate more actively in society (Rifkin, 2000).
3. *Intermediation of social innovation by knowledge-intensive service organizations.* Knowledge-intensive public, third sector or private sector service businesses may play

a leading role in organizing and diffusing social innovations in service sectors. These organizations may be intermediaries, acting on behalf of users. Both services innovation and social innovation scholars share a growing interest in third sector organizations (Djellal and Gallouj, 2013, Rubalcaba et al. 2012, 2015). Third sector organizations may produce service innovations either autonomously, with state support, or else work in partnership with public organizations to co-create and implement new/improved services (Harrisson et al., 2010). In social services and other public sectors, notably health and education, there has been a rise in levels of service provision by not-for-profit third sector organizations. These include cooperatives and associations, charities, NGOs, and social entrepreneurs. Third sector organizations can play a key role in the social integration of disadvantaged people (Moulaert et al. 2005). Public-private-third sector innovation networks were researched by the EU-funded ServPPIN project and its outputs published in Gallouj et al. (2013).

One can identify three areas where the conceptual understanding of service innovation differs from social innovation:

1. *Incentives*. Whereas commercial service innovation is driven by the profit motive, social innovation is driven by principles of inclusion and well-being. These are different criteria for measuring success; the creation of economic profit through service innovation differs to the social value of a social innovation. This is not to say that commercial service innovations do not induce well-being. Rather, commercial innovation is incentivized by expected profits. The Stanford Social Innovation Review (Phills et al., 2008) defines social innovation as ‘a novel solution to a social problem that is more effective, efficient, sustainable, or just, than existing solutions and for which the value created accrues primarily to society as a whole rather than to private individuals’. This corresponds to the argument of externalities in economic theory. Externalities are seen as the source of partial or total market failures, and are the basis for policy intervention. In Phills et al.’s definition, externalities are a prime motivation for social innovations. For example, microfinance enables billions of people to gain access to capital to invest in activities that might allow them to escape poverty. The bulk of the financial value created by microfinance institutions accrues to the poor and the general public rather than to individual entrepreneurs or investors.
2. *Empowerment*. Social innovations seek to empower citizens. They differ from conventional market innovations where they intend to empower citizens, whether through the creation of new roles and relationships (e.g. between the citizen and the state), the development of assets and capabilities, and/or the more efficient and environmentally sustainable use of existing assets and resources (Science Communication Unit, 2014; Chiappero-Martinetti and Von Jacobi, 2015). Mendell and Neamtan (2010) view social innovation in terms of governance, participation and empowerment. In some cases, services innovations can be transformed into social innovations through the very active role of empowered citizens, as happens in the cases of rural tourism or cultural services in developing economies (Rubalcaba, 2015)
3. *Imitation*. Diffusion is a key aspect to any innovation process. Without diffusion, an innovation does not have an economic or social impact. However, attitudes towards imitation differ between social innovators and their private sector service counterparts. Social service innovators often actively encourage imitation and the rapid dissemination

of new service ideas and practices. In practice, the dissemination of new ideas and practices is challenging. This is due to two characteristics of social innovations. First, they tend to be very local in nature. Second, there is often a lack of codification. Social innovations are frequently developed by local networks whose vitality can lead to new jobs and new services. Scaling up innovations from a highly localized context requires a strengthening of systemic features. This may require new types of practices that can facilitate the codification of social innovations and the procedures applied (Harrison et al., 2010; Windrum, 2014).

4. MULTI-AGENT FRAMEWORK OF SOCIAL INNOVATION IN SERVICES

In this section we present a multi-agent framework for analysing the co-creation of a social innovation. The approach is rooted in the work of Kelvin Lancaster (1966, 1971) on product characteristics and consumer demand. Gallouj (Gallouj and Weinstein, 1997; Gallouj, 2002) and Windrum (Windrum and García-Goñi, 2008; Windrum, 2013) have developed this approach and applied it to public and private sector services innovation, expanding the analysis to include the roles of government, third sector and other agents in the innovation process.

The social innovation considered in this paper is the rapid application, by laypersons, of first aid to a person suffering a heart condition. Sudden cardiac arrest (SCA) is a heart rhythm disorder by which the heart suddenly and unexpectedly stops beating. The heart has an internal electrical system that controls the rate and rhythm of the heartbeat. With each heartbeat, an electrical signal spreads from the top of the heart to the bottom. As the signal travels, it causes the heart to contract and pump blood. The process repeats with each new heartbeat. Problems with the electrical system can cause abnormal heart rhythms called arrhythmias. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm. These arrhythmias cause SCA. When the heart stops, blood stops flowing to the brain and other vital organs.

Two-thirds of SCA deaths occur without any prior indications of heart disease. In Europe, SCA is the leading cause of death, with an incidence of 700,000 cases a year. The UK is at the top of the list with a reported out-of-hospital cardiac arrest incidence of at least 123 cases per 100,000 population (76,000 deaths) per annum. For every minute that passes without CPR and defibrillation, the chance of survival decreases by 7–10%. The combination of cardiopulmonary resuscitation (CPR) and early defibrillation (i.e. before an ambulance arrives) is, in many cases, the only way to restore the victim's heart rhythm to normal and ensure survival. When carried out together, the likelihood of SCA survival rises from just 5% to over 50% (Arrhythmia Alliance, 2013).

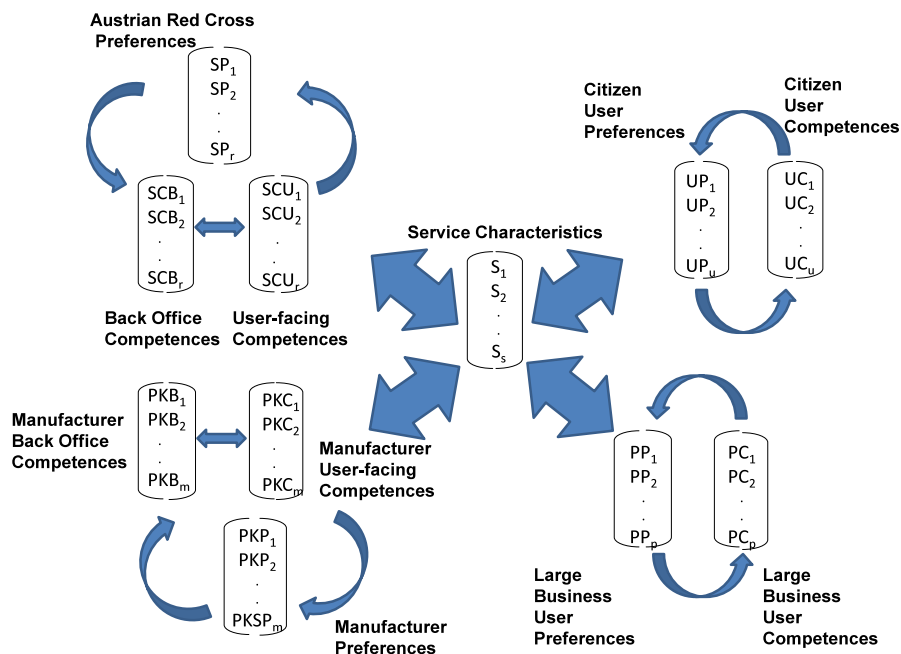
The framework presented here is a development of the Windrum and García-Goñi (2008) multi-agent framework. This has a number of advantages. First, it enables a modelling of the interactions of the stakeholders who co-create and diffuse social innovations, and how these interactions shape the features of new co-created services. A second advantage of the framework is that it makes explicit the preferences and competences of different organizations. It focuses attention on areas of common interest between different stakeholders, and/or coalescing interests which are necessary for the co-creation of a social innovation.

There is a long-term co-evolution of agents' competences and interests, and social innovations. The development and diffusion of social innovations requires both (a) the direct implementation of knowledge and competences of citizens and organizations (public, private or third sector), and (b) the mobilization of material and/or immaterial factors. Interactions between key stakeholders facilitate/inhibit the co-creation of social innovations, shape the features and characteristics of innovations, and determine the extent to which the resulting innovations diffuse.

The diffusion of radical social innovation can, in turn, alter the status quo. The demonstrated success of social innovations alters agents' mental models regarding the range of options that are socially feasible and the ways in which services can be co-created and delivered. This captures the central neo-Schumpeterian message of long-run change. A system does not simply grow over time, its composition qualitatively changes due to the introduction of social innovations that support previously unavailable services and activities.

Let us begin by considering the service characteristics of the social innovation behind the Austrian nationwide public access defibrillation (ANPAD) programme. The service characteristics are the vector $[S_1, \dots, S_s]$ in Figure 1. The application of first aid by a layperson to someone suffering a sudden cardiac arrest (SCA) involves a combination of human knowledge, artefact features, geographical proximity, and organisation. Thus, each of the different agents in Figure 1 contributes to the set of service characteristics $[S_1, \dots, S_s]$.

Figure 1. A Multi-Agent Framework for Social Innovation in Services



Laypersons (citizens/users) are important service co-creators, as it is they who deliver the health care service to someone suffering an SCA. The chances of survival are increased the higher is the number of informed laypersons who can take appropriate action as quickly as possible. User competences differ significantly, and have a direct impact on survival rates. For example, in Stavanger in Norway, where pupils learn CPR at school, survival from

cardiac arrest is 25%, compared with just 7% in England where this is not on the school curriculum (Arrhythmia Alliance, 2013).

One or more laypeople must have the confidence and the competences [UC_l, \dots, UC_c] to act in this situation if a person's life is to be saved. They must search for an AED, have the confidence to apply the AED and follow its voice instructions, and phone the emergency services.

If the patient is having an SCA, the AED device delivers an electrical shock to normalise the heart rhythm. However, the AED will not deliver a shock if the patient is not having an SCA, e.g. if the patient is suffering a heart attack (a myocardial infarction (MI)). If this case, and the patient's heart has stopped beating, the layperson will need to apply cardiopulmonary resuscitation (CPR) until an ambulance arrives.

The layperson's confidence and competences [UC_l, \dots, UC_c] are strongly affected by their first aid training. In Austria, the Austrian Red Cross (ARC) is the primary provider of first aid training. It sets the national guidelines by which all first aid trainings are carried out. Within the national guidelines are specific guidelines for training with AEDs. Every employer must train their personnel in the use of AEDs as part of the obligatory first aid training.

As we shall see in greater detail section 5, the ARC also played the leading role in organizing the innovation network for the development and widespread access to AEDs in Austria. The goal of the ARC was for AEDs to become as widely available as fire extinguishers and laypeople to have the confidence to use them whenever they see it is necessary. The ARC used its expertise [SCU_l, \dots, SCU_r] and position to work with manufacturers to design a handheld defibrillator that safely could be used by laypersons, and defined the service package that includes installation advise, the annual training of personnel, regular AED checks, free refill after use, and has actively worked with large businesses to have AEDs installed on their premises.

An important factor determining survival rates is the geographical density of AEDs, and the best placement of those AEDs that are available. Both affect the time taken to locate an AED and to bring it to the person having an SCA. A key role was played by large business users – shops and other Austrian firms or subsidiaries of international firms located in Austria – who led in purchasing and installing AEDs in the workplace, and paid for staff to be trained in their use. By purchasing the service package from the ARC, these lead adopters added value to their own companies by providing health care and a safer environment for customers and staff. This enabled them to differentiate their marketing strategy through corporate social responsibility.

Last, but not least, the features of the AED products developed by manufacturers comprise key service attributes within the vector [S_l, \dots, S_s]. An AED must accurately diagnose lethal arrhythmias under unfavourable conditions that may degrade performance. An arrhythmia analysis algorithm should respond in one of two ways to an electrocardiographically recorded rhythm: it should advise (or in a fully automated system, deliver) a therapeutic dose of electricity, or it should advise no shock (and not deliver a shock) (Kerber et al., 1997). An AED can also notify the operator of a suspected artefact in the electrocardiographic (ECG) signal.

5. THE CO-CREATION OF PUBLIC ACCESS DEFIBRILLATION IN AUSTRIA⁴

In this section we consider the various ways in which the ARC worked with the different interests of key stakeholders to foster a multi-agent innovation network that successfully co-created the AED social innovation.

During the late 1990s there arose an international discussion on ‘public access defibrillation’, or the “widespread distribution and use of AEDs by nonmedical, minimally trained personnel (e.g., security guards, spouses of cardiac patients).” (Kerber et al., 1997, p. 1677). The use of AEDs by trained emergency personnel (emergency medical technicians, paramedics, and first responders such as firefighters and police personnel) had proven highly successful. The issue was whether AED use could be safely extended to non-trained laypeople. However, public access defibrillation posed unique challenges. In the late 1990s there was no evidence base on the use of AEDs by laypeople in stressful situations, there was no institutional support for public access defibrillation, no training of laypeople, and there was a need to develop simpler AEDs that were easy to operate, as in many cases by first-time users with minimal training.

A window of opportunity for the Austrian nationwide public access defibrillation (ANPAD) programme was provided by an amendment of the Austrian Paramedic Law in 1999. This allowed paramedics, in addition to medical doctors, to apply handheld AEDs. Shortly thereafter, a judicial clarification from the Austrian Ministry for Health established that every Austrian citizen is allowed to buy and operate a handheld defibrillator, even without prescription and authorisation. Still, there was great commercial uncertainty at that time. A suitable AED had not been developed or tested, and it was unclear if there would be sufficient demand from commercial and private users to cover R&D investment.

Given the multi-agent contributions to the service characteristics [S_1, \dots, S_s] of public access defibrillation (see above section), it was necessary to bring together and organise an innovation network capable of co-creating this social innovation. No single stakeholder could organise and develop this social innovation by itself. Physicians do not possess the necessary production and marketing competencies; AED manufacturers specialize in the technical knowledge associated with handheld defibrillators but less on medical impacts of their use; medical personnel lack the competences of these other organizations and also lack the means of organising a national media campaign to raise awareness. The average citizen does not have the required financial means, or technical, medical or media competences required to develop AEDs for laypersons.

It was the Austrian Red Cross (ARC) which took the lead role in organizing the innovation network for the ANPAD programme. In the remainder of this section, we examine why this third sector organization was uniquely placed to perform this role, and the strategy it pursued to build the co-creation network.

5.1. *Preferences and competences of the ARC*

Public access defibrillation requires organisation and financial resources sufficient to establish a geographical density of portable AEDs. It became clear, during the late 1990s, that

⁴ The authors want to thank the Austrian Red Cross, in particular Gerald Czech, Roman Fleischhackl and Gerald Foitik (in alphabetical order) for going to the time and effort of providing us with valuable information on their project. For details on the background material and list of interviews, please see Schartinger, D. 2013. An institutional analysis of innovation in healthcare services. In F. Gallouj, L. Rubalcaba, & P. Windrum (Eds.), *Public-private innovation networks in services*. Cheltenham, UK. Northampton, MA, USA: Edward Elgar.

the Government would not play a leading role in organising and funding public access defibrillation. The public access defibrillation debate was of great interest to the ARC. It had a good fit to the preferences of the organisation (the vector $[SP_l, \dots, SP_r]$ in Figure 1), which is to save lives. The ARC has a remit for developing new ways of improving first aid to significantly reducing avoidable deaths. 50,000 people work for the ARC. The vast majority are volunteers who are motivated by a desire to making a difference, and having a positive impact on society. The ARC's volunteers provide a multitude of personal and professional network links for engagement and building action for social change, through families, employers, colleagues, and business associations. Public access defibrillation provided an opportunity for the ARC to take a pioneering role, and to further enhance its national reputation.

The ARC concluded that a radically new innovation strategy and very different type of innovation network would have to be set in place in order to achieve the goal of implementing a dense network of AEDs in all public places in Austria, and to inform sufficient numbers of laypeople on how to use them.

The ARC possesses the back office competences [the vector $[SCB_l, \dots, SCB_r]$ in Figure 1)] to organise and mobilise its volunteer base through its regional offices across Austria. Once strategy had been decided upon (see below), the key task of senior managers at the ARC's HQ in Vienna was to garner support across its regional branches in order to successfully carry out its strategy.

Prior to the start of the ANPAD programme in 2002, various communication activities were used to engage with, enrol, motivate, and gain commitment from the ARC's membership between 2000 and 2002. These included roadshows that presented the project, gained feedback on the strengths and weaknesses of different options for roll-out, and on how to organise and integrate first aid training on AED use. These are activities which needed to be organised and delivered locally. There were discussions on strategy, the contributions required from each district and regional office, the local problems faced, and the concerns and worries of local members. The programme represented additional work for people at all levels and in all areas of the ARC and, once suitable AEDs would be available from manufacturers, these needed to be distributed to each of the ARC regional organisations and effective first aid training and advice immediately provided across the country.

The ARC has the necessary gravitas within the Austrian health system, and possesses the user-facing front office competences $[SCU_l, \dots, SCU_r]$ and back office competences $[SCB_l, \dots, SCB_r]$ (Figure 1) required to provide leadership in the ANPAD programme. To begin with, the ARC is an established and trusted advocate of citizens in the area of first aid. In this role of trusted representative, the ARC 'speaks on behalf' of the preferences and interests of individual citizens (laypeople) $[UP_l, \dots, UP_u]$. The need for a representative arises due to citizens' lack of information, and their not disposing of the knowledge of what is best for them. Hence, citizens depend on expert advice (Arrow, 1963, 1965 and Hodgson, 2007). In this particular case, the ARC has a motivation and the necessary absorptive capacity to follow and understand the implications of international scientific developments in portable AEDs,

and has the financial and organizational competences to communicate to manufacturers the latent demand for portable AEDs.

The ARC also has a unique position with regards to first aid training in Austria. Under the Austrian Workplace Regulation (*Arbeitsstättenverordnung*), the ARC is the sole organization who specifies the Guidelines on first aid training. The ARC was therefore in a position to modify the Guidelines such that every employer is required to train their personnel in the use of AEDs as part of the obligatory first aid training.

5.2. The ARC Strategy

The ARC's strategy had two legs. The first leg involved communicating the advantages of public access defibrillation to different stakeholders in society. Here it engaged with the interests of each stakeholder, highlighting the win-wins of portable AEDs. The second leg of the strategy was to initiate the widespread adoption and placing of AEDs in public and work spaces.

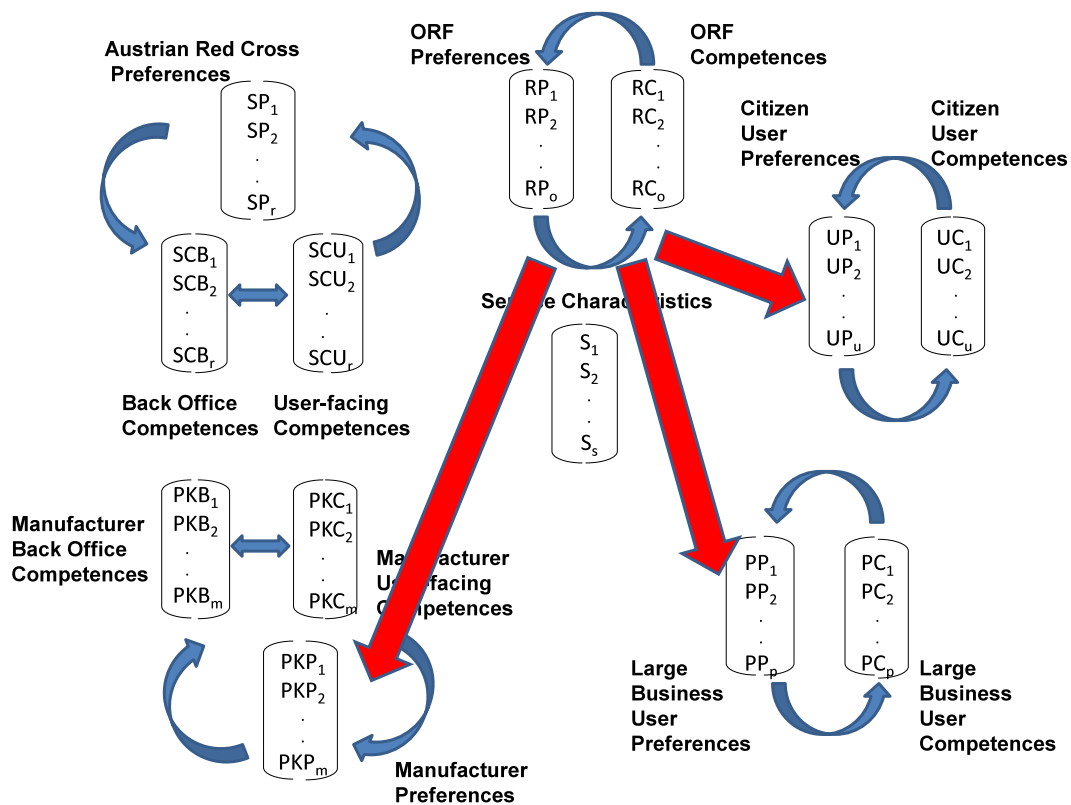
For the first leg of its strategy, the ARC needed to communicate the advantages of the ANPAD programme to all relevant stakeholders. For patients this would significantly increase the chances of surviving an SRC. For ambulance and emergency services it increases the likelihood of being able to revive patients, for AED manufacturers it represented a new market opportunity, for the large corporate adopters it led to an improvement in social corporate responsibility by making the workplace safer for their staff and their customers, for medical scientists it provided a new research domain, for the ARC it raised its reputation and for its regional branches offered new ways of raising revenue through sales of service packages, and for the Austrian Broadcasting Corporation (ORF) the ANPAD programme fits well with the Corporation's public service remit.

A highly successful media campaign played a significant part in achieving stakeholder engagement. Here the ARC cooperated with the ORF, which is Austria's largest broadcasting corporation. There exists a long standing and mutually beneficial relationship between these two organizations. Each has a mutually beneficial interest. The ARC is a not-for-profit organisation that is dependent on donations. It needs to make the public aware of its achievements. For the ORF, ARC's activities, and their societal impact, are newsworthy stories that fit its public service remit. Thus, the user facing competencies of each organization mutually enhances the other.

The ORF ran an intensive media campaign, lasting over three weeks during 2003 to raise awareness and open up a national discourse on the scale of deaths attributable to SCA each year, and the potential impact of defibrillation in reducing the death toll. The media campaign included features within TV and radio programmes, discussions on TV shows, and items on the evening news. The media campaign succeeded, not only in raising awareness of SCA, but also of the need to social change in order to address this problem.

Figure 2 enables one to appreciate the effectiveness of the ORF’s media campaign. Although the ORF does not contribute directly to the service characteristics vector $[S_1, \dots, S_s]$, its media campaign altered the preferences of key stakeholders – citizens vector $[UP_1, \dots, UP_u]$, large business users $[PP_1, \dots, PP_p]$, and manufacturers $[PKP_1, \dots, PKP_m]$ – by changing their mental models with respect to the need for public access defibrillation, and of their own roles and responsibilities to make this change happen. The media campaign was a key factor behind the success of this social innovation.

Figure 2. Influence of the ORF Media Campaign on Stakeholders’ Preferences.



The second leg of the ARC strategy was to mediate supply and demand and hence radically impact on the reorganisation of the market for AEDs in Austria. Its aim was to establish a geographically dense installed base of handheld defibrillators. This required the ARC to work with AED manufacturers to develop devices that can be used by laypeople, and with the medical research community to establish an evidence base on their effectiveness. The principle organisers of the ANPAD programme were the Head of the Innovation Department and a researcher from the Research Institute of the Viennese Red Cross, who carried out the trial study on the use and effectiveness of AEDs, and organised roadshow presentations at regional Red Cross organisations.

At that time, there were six manufacturers who were selling in Austria, AEDs for professional medical personnel. Some were local manufacturers, others were foreign firms with subsidiaries in Austria. The ARC invited all six firms to submit a tender, with the goal

of selecting two or three firms with whom it could be working closely on the design of an AED suitable for use by laypeople. The selection was made using two key criteria. The first criterion was that the AED manufacturer must provide an initial 100 AEDs for training purposes for free. This was necessary for the ARC to train its personnel over Austria.

Many of the AED firms struggled to meet this criterion. Either they had not yet started development work, or else they were still developing AEDs for laypersons and were unable to deliver 100 devices in a short timescale.

In order to encourage manufacturers to invest in R&D, and to speed up production timescales, the ARC committed to purchasing at least 200 AEDs, with a bulk purchase discount. This was a risky move for the ARC, as it was unclear at the time whether the media campaign would be successful. For AED firms, this bulk contract tied, for a number of years, their production capacity to the Austrian market.

The second criterion was usability. The ARC stipulated that an AED must be easy to use by laypeople who are first responders in stressful situations. Voice instructions, for example, must be as effective for citizens untrained in first aid as it is for those who have received first aid training. Some AED manufacturers found it difficult to switch from designing AEDs for professional medical personnel to designing AEDs for laypersons. In particular, they found working with laypersons on voice instructions to be challenging.

Establishing the evidence base for the medical effectiveness of AEDs by laypeople was an important part of the ANPAD programme. Trials were set up, with every application of a handheld defibrillator producing a predefined set of information that was sent to the Research Institute of the Viennese Red Cross for analysis (Fleischhackl et al., 2004, 2006, 2008). In establishing and promoting the outcomes of the trials amongst the medical community, the ARC used its links with the Austrian medical community, and in particular the Vienna General Hospital (AKH Wien), to good effect. First, a number of chief physicians from the Vienna General Hospital were invited to become members of the ANPAD Programme Steering Committee. Second, the researcher from the Research Institute of the Viennese Red Cross, who carried out the trial study, was affiliated to the General Hospital in 2003.

The ANPAD programme also addressed the demand for AEDs. Once the supply of suitable AEDs has been organised, it was essential to stimulate the demand side of the market. The ARC targeted large corporate businesses that have many branch locations across Austria, such as Österreichische Post AG, Telekom Austria, and large supermarkets, and sought to persuade them to install AEDs on their premises. To this end, the ARC designed a service package around the new AEDs and entered into negotiations with these large corporates. The service package comprised the purchase of an AED, installation advice, the annual training of personnel, regular checks, free refills after use, and promotional materials for staff and customers which tied in to the national ORF media campaign. The ARCD marketed this service package to large corporate users as a means by which the users could distinguish themselves from rivals as being more socially responsible corporates who offered a safer environment for customers to shop in, and for their staff to work. The names of these early adopters would

also be used in the media campaign, adding national credibility to the ARC's campaign and at the same time providing positive national advertising for the corporates.

The success in attracting large corporates to its successful media campaign made it easier to attract smaller businesses, and the ARC was able to achieve its goal of having a dense installed base of portable AEDs.

6. SUMMARY AND CONCLUSIONS

The paper has sought build a bridge between social innovation and service innovation research through the development of a multi-agent framework that contains key social innovation concepts and which brings to bear insights from the service innovation literature. Social innovation involves the co-creation of new services/products, and is shaped by the interactions between key stakeholders.

The AED case study highlights the prominent position that is often taken by social entrepreneurs or third sector organizations (NGOs or charities) in organizing the process of social innovation. Of particular interest here is the way in which the interests of individual citizens were 'represented' by the Austrian Red Cross as a 'patient advocate'. This supports previous research by Moulaert et al. (2005), Harrison et al. (2010), and Windrum (2014) on the roles played by social entrepreneurs and charities in the creation and diffusion of social innovations. In health, charities and other third sector organisations have the capabilities and financial resources to fund research and the necessary connections with political actors and private/public sector health organizations to identify and organise co-creation networks. In so doing, third sector organizations can improve the quality of life of individuals and communities which they represent, further enhancing their reputation and (inter)national profile.

The Austrian nationwide public access defibrillation (ANPAD) programme provides an exemplar of the process of co-creation by which this social innovation was developed, implemented, and sustained. Here the ARC acted on behalf of citizens, organizing an innovation network capable of creating both the demand and the supply side of a sustainable market for the production and safe application of portable automated external defibrillators (AEDs) in Austria. This process involved, first, raising public awareness of the need for portable defibrillators and acting as a user representative when inducing changes in the design of portable AEDs. Later, there was the institutionalization of AED training in every first aid training in Austria, work with local manufacturers to produce this device, and with large user organizations to install AEDs on their premises.

In this article we have established a first, primarily theoretical, bridge between social innovation and service innovation, applying to social innovation a Lancasterian-inspired model initially built for services. However, this dialogue between social innovation and service innovation should be pursued in many other research directions. We will limit ourselves here to mentioning three of them which involve i) measurement issues regarding

innovation and its effects, ii) the focus on certain sectors and actors, iii) benchmarking strategies.

Both social and service innovation suffer from mis-measurement. Research efforts are necessary in this field. They should address both the identification and measurement of innovation as such and of its effects. For example, social innovation is still absent from OECD indicators. It should be included in OECD Oslo Manual just as other forms of non technological innovations. Furthermore, in social innovation even more than in service innovation in general, addressing performance requires multicriteria evaluations which take into account not only efficiency, but also effectiveness, quality, fairness, ecological sustainability, etc.

The public service sphere seems to be a privileged field for social innovation. This is not surprising as far as public administrations are supposed to be social interaction nodes formed in a “public service spirit” based on the principles of fairness, equality of treatment and continuity. Research efforts should for example seek i) to understand the role of the public sector in the provision of socially innovative services in different kinds of public services; ii) to focus on the role(s) played by public actors (including funds and agencies) and public action within social innovation processes and networks over their life cycles.

The third important field of research envisaged is more operational. As far as our analysis has highlighted the importance of end-users, Third Sectors and the public sector in social innovation, it would be interesting, in a benchmarking perspective i) to identify which are the best practices and tools to obtain a more effective and wide participation of the final users and third sector in social innovations ii) to target public sector performance, analyzing the role of supervising and monitoring authorities, and providing recommendations for improved monitoring.

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