Practice-based Perspective on Technology Acceptance: Analyzing Bioactive Point of Care Testing

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Received: April 19, 2011 Accepted: May 16, 2011 doi:10.5539/ijms.v3n3p13

Abstract

In this study, we focus on identifying the context-specific characteristics related to the use and adoption of a bioactive innovation. Through qualitative methodology the study focuses on the existing practices of point of care testing (POCT) in the human and pet health care and wellness markets. The empirical data was collected in Finland through individual interviews, target group discussions, and self-documentation packages. Our results show that innovation characteristics are reflected through the events of existing practices in the field. We conclude our findings by presenting a practice-based framework for the adoption of an innovation, highlighting the role of events in practices as well as their interaction with actors and innovation characteristics. This framework allows us to suggest that the acceptance of an innovation is closely connected with the acceptance of existing and emerging practices.

Keywords: Technology acceptance, Innovation diffusion, Practice-based approach, Health care market, Pets' wellness market

1. Introduction

A growing number of studies indicate that biotechnology, in the form of biosensors and point of care tests for instance, opens up new opportunities for creating added value and for developing cost-effective products for health care (Olenic, et al., 2009; Gustafsson, et al., 2009; Hossain, et al., 2009). There is a need for new innovations in the health care market in developed and developing countries due to several reasons; the high standard of living in developed countries is creating more demand in the health care market, while the costs of public health care are expected to diminish. (Parjanne, 2004; Kivisaari, Kortelainen, Mäkinen, & Saranummi, 2001). Accordingly, in developing countries, there is a need for low-cost diagnostic tools complying with a decentralized approach. Thus, biotechnologies are seen to be important in improving health in the poorest countries because current health products and practices are not in balance with local economics and cultures (Chin, 2009).

It makes sense to include health care, pet professionals, and athletes in the same study because physical activity and health are connected to each other. It is also argued that pet owners see pets as family members. This is manifested by an increasing variety of pet products in the market. According to Barnes (2005) consumers are projecting their own health concerns onto their pets, and pet owners are also increasingly testing their pets for health issues. There are also demands for sport-related activities throughout the world because of an increasing emphasis on health, fitness, and the related business possibilities (Herstein & Jaffe, 2008). For example, the challenge with type 2 diabetes requires new tools and methods to monitor and manage physical activity and glucose levels (Allen, Jacelon & Chipkin, 2009).

During the recent years there has been an increasing interest to utilize bioactive paper-based products for clinical

purposes, for monitoring the environment, and so on. Hence, several research projects are developing new bioactive innovations and applications to be used in personal health diagnostics; these innovations would be manufactured at a lower cost than current products. (Pelton, 2009; Aikio et al., 2006). The bioactive innovation discussed here is mass-manufacturable bioactive paper which exploits chemical or biological reactions to detect and quantify a specific analyte or event. The innovation includes functionalities based on the specific properties of biomolecules, such as enzymes or antibodies (Aikio et al., 2006). These functionalities can be implemented in point of care testing (POCT), which is the focus of the study.

Our previous study concerned the given bioactive innovation (Jaakkola & Alakärppä, 2009). One of our findings was that innovation characteristics – relative advantage, compatibility, treatability, perceptiveness, and perceived uncertainty – are influential in the early-stage innovation adaptation process of the *producers* of bioactive technology. Moreover, we identified two key challenges in this process requiring a more detailed examination: 1) the effect of a new innovation on customers' behavior or routines and on the innovation's adoption and 2) the factors affecting the adoption of a new innovation in different environments.

In the study at hand, we focus on end users and address these two challenges through the multidimensional lenses of environmental theory and practice. Practice-based studies have recently gained momentum in business studies (for a good review, see Gherardi, 2009). In our study, practices are understood as habituated ways of people and communities to act and employ different tools and possibilities afforded by the environment (Norros, et al., 2007). In other words, practices explain the issues and aspects that an acting person takes into consideration when accomplishing a task; they also present the underlying logic following this accomplishment.

In this inquiry, we set out to empirically explore, through qualitative methodology, the practices of point of care testing (POCT) in public health care services, pet health care, and in the monitoring of athletes' wellness so as to understand how a new bioactive innovation is adopted in these practices and how it is involved the creation of new practices. In particular, we focus on identifying the context-specific characteristics of the bioactive innovation affecting its acceptance. Thus, the specific research questions are:

- *What kinds of practices exist in the point of care testing of people and animals?*
- *What is the effect of the identified practices and innovation characteristics on innovation acceptance?*

The main task of this study is to modify the framework of the practice-based approach for studying the acceptance of an innovation and to formulate a strategy and practice-based guidelines for entering the health care and wellness market for humans and pets. Hence, this study produces new context-specific information about the practices of point of care testing in the market in question, and about the way in which these practices play a role in determining whether the innovation could be widely accepted or not.

This paper is structured as follows: The next chapter will briefly outline the theoretical background covering the concept of acceptance, the existing technology acceptance models, a short introduction on the practice-based approach, and a description of how and why this approach is used in the study at hand. Thereafter, the paper will portray the empirical case and the methodology. The results of the study are presented in the fourth chapter. The paper concludes in a discussion on the theoretical and managerial contribution of the study and in a presentation of generic guidelines on entering the bioactive point of care testing market.

2. Theoretical background

2.1 The concept of acceptance

The concept of acceptance has been defined in very different ways (Shakel, 1991; Nielsen, 1993; Davis, 1989; Dillon & Morris, 1996; Arning & Ziefle, 2006; Norros & Kaasinen, 2007). Thus, we should first find a proper definition for it.

Dillon and Morris (1996) have defined user acceptance as a demonstrable willingness within a user group to employ technology for the tasks it is designed to support. This definition is connected with information technology and emphasises the designed and intended use; in other words, it can be considered as a task-oriented definition. Arning and Ziefle (2006) determine technology acceptance simply as accepting a new technology and system for continuing use with satisfaction.

However, literature that conceptualizes acceptance mainly in psychological terms provides little understanding about the social and cultural aspects involved in acceptance – as argued by scholars leaning on socio-cultural perspectives. The sociotechnical theory of acceptance (Geels, 2005; Trist & Murray, 1993), for instance, maintains that the acceptance of innovation is comprehensible only in terms of the context in which it is embedded, and, in

terms of its organizational fit. Activity theorists, for their part, share this basic tenet but put even more emphasis on understanding the praxis, the way activities are performed, in examining the likely acceptance of or resistance to innovation (e.g. Bannon & Bodker, 1991). According to Karahanna and Straub (1999) most studies on users' attitudes and beliefs have been conducted after the system has already been adopted, and the studies have been made in the light of perceived usability and ease of use.

Shakel (1991), in turn, has presented the product perception model, in which acceptance consists of utility, usability, likeability, and costs. Utility refers to how well the functionality of a product corresponds to the user's needs. Usability appears in the way utility occurs in practice. Likeability means emotional evaluation, whereas social and communal consequences refer to pecuniary loss.

Alakärppä (2001) has divided acceptance, inspired by Nielsen´s (1993) definition, into personal, practical, social, and cultural acceptance. According to this definition, *personal acceptance* refers to a need to use technology at the personal level as the result of sickness or changes in one's ability to perform. It is also related to the acceptance of the external form of a product. *Practical acceptance* refers to accepting a product and its functions, the usability and specific characteristics of the product, and the way the product meets the practical requirements set to it by the user. S*ocial acceptance* refers to whether using a product fits within the generally accepted norms. It has to do with the fact whether the product can be taken to public places without negative consequences, such as shame or anxiety experienced by the user or an outsider. *Cultural acceptance* describes how well a product suits the surrounding culture and environment and whether it is acceptable in terms of the specific culture of a user group. The acceptance of technology has also been defined from the point of view of practices by Norros and Kaasinen (2007). According to their definition, acceptance means an individual's and community's demonstrable willingness to adopt and to develop practices made possible by a technology and the environment.

For the present purpose, user acceptance is defined by a user's willingness to bring technology into use for the practices it is designed for or adapted to. It is also defined according to the appropriateness of a technology to user practices and to a user's social and cultural environment.

2.2 Models of user acceptance

A wide range of conceptual frameworks have been developed for understanding user acceptance, and they have provided important insights into the stages through which an individual or an organization passes when deciding to accept or reject an innovation (see e.g. Dillon 2001; Morris & Dillon, 1997; Frambach & Schiellewaert, 2002; Rogers 2003; Venkatesh, Morris, Davis, & Davis, 2003; Harmancioglu, Droge & Calatone, 2009; Zolait, Mattila & Sulaiman 2009).

During the last decade, the relevance of Technology Acceptance Models (TAM, TAM2) has been established. These models have provided valuable insights into the ways in which innovations and information technology are accepted in working environments (Hillmer, 2009). However, the TAM models have been criticized for not being able to fully explain the significance of individual differences or the role of established social habits in acceptance (Burton-Jones & Hubona, 2005).

While the more recent Unified Theory of Acceptance and Use of Technology model by Venkatesh, et al., (2003) pays attention to the social effects of adoption, it is, nevertheless, based upon the managerial and normative perspectives of an organization. This is in line with the study by Arning and Ziefle (2009). They have found evidence of technology-specificity in acceptance and noticed that the current approaches of technology acceptance describe a static perspective, whereas the acceptance of health care applications may involve dynamic components and multidimensional behavior. There is also some evidence about the effect of vendor activities and colleagues on acceptance in health care. In a Swedish study (Roback et al., 2007) technology adoption in health care was primarily initiated by vendor activities. However, information about the functionality of technology was mainly sought from close colleagues.

The main criticism against the present models holds that they have concentrated on the user without differentiating between individuals, the usage environment, and other socio-cultural variables and that they affect innovation diffusion (Fife & Pereira, 2005; Lu et al., 2005; Homburg, et al., 2010; Turner, 2010). Acceptance is the first step toward constant use (Karahanna & Straub, 1999). The variables affecting the use and acceptance of technology at the acquisition stage differ from those during constant use.

Until now the relationship between users and technology has been studied mainly from an instrumental point of view. This is in line with the study by Turner et al., (2010) in which they conclude their systematic literature review on the TAM model by underlining that the model should be used carefully outside the context in which it has been validated as its variables such as perceived ease of use (PEU) and perceived usefulness (PU) do not

fully correlate with actual usage.

Actions necessarily take place in materialized contexts. It is therefore important to pay analytic attention to the way the material world, for instance in the form of design or lay out, has effects on human action (Warde, 2005). A change in material reality may effectuate a change in a practice. Moreover, the performance of most actions requires objects, and many actions are directed to objects (Miller, 2005). People also commonly develop relations with certain kinds of objects that may be as intimate as the relations they develop with each other. To understand the materiality of an innovation and the involvement that new material objects can potentially inspire are hence important aspects in the determination of acceptance.

2.3 Conceptual practice-based approach of the study

We strongly agree with Orlikowski (2000) as he points out that "*A practice lens assumes that people are purposive, knowledgeable, adaptive, and inventive agents who engage with technology in a multiplicity of ways to accomplish various and dynamic ends."* The practices which are manifested at the individual level are created as a part of the cultural practices of communities and societies. Hence, the identification of user needs would have to be directed to practices instead of single acts to be able to define the context of behavior more profoundly (Geiger, 2009). We believe that in the context of acceptance, the significance of individual differences, ways, and habits can be studied through the concept of practice.

Sociotechnical theory of acceptance (Geels, 2005; Trist & Murray, 1993) maintains, for instance, that the acceptance of innovation is comprehensible only in terms of the context in which it is embedded and in terms of its organizational fit. Activity theorists, for their part, share this basic tenet but put even more emphasis on understanding the praxis, the way activities are performed, in examining the likely acceptance of or resistance to innovation (e.g. Bannon & Bodker, 1991). We continue these latter streams of thoughts by way of working towards a practice-based approach to user acceptance (Schatzki, 1996, 2001; Schatzki, Knorr-Cetina & Von Savigny, 2001; Reckwitz, 2002). Practice theory, which has gained increasing interest in recent years, represents one form of cultural theory that is based upon a distinct social ontology in which the social is seen as a field of practices (Schatzki, 2001).

In our framework, the focal point is user acceptance in bioactive innovation (Figure 1). Routinized *actions* are seen as subcomponents of *practices* emerging in a certain context; they can be seen as stages which are required to carry out wider practices. For example, when conducting a point of care test there are several essential steps before the operation is finished (Alakärppä, et al., 2010, Valtonen, et al., 2010). The characteristics of an innovation are supposed to affect and be interconnected with actions and practices.

The basic elements of the study are actions, innovation characteristics, practices, and contextual factors. Special attention is paid to contextual factors and their impact on user acceptance. The user experience (and acceptance) is formed through product–user interaction between the user, the product, and the environment of use as presented by Buchenau and Fulton Suri (2000). Thus, interaction becomes concrete through usage, in particular. Contextual factors are inspired by Bronfenbrenner´s (1986) ecological theory and the model presented by Boer, Van Baalen & Kumar (2002). Several researchers (Altman, 1975; Bronfenbrenner, 1986; Forlizzi, et al., 2004; Lawton & Nahemow, 1973) have constructed environmental classification systems where the common denominator is the number of environments or systems covering at least three levels. The different levels of these environments can be classified coarsely as follows: a) private/personal level, b) semi-public/group level, and c) public level/level of organiz ions and communities.

The contexts of our study are classified as follows: 1) the home environment, 2) the home and hospital environment, and 3) the hospital environment. The mix of the private- and organization-level contexts, creating a semi-public context, is called here as the *home and hospital environment*. It means a situation in which an innovation is first used at home and then in a hospital or vice versa. For example, some samples are first taken at home and then further investigated at the hospital.

For the purpose of this study, the key benefit of the practice approach is that it offers conceptual tools for the exploration of the myriad of everyday practices – routinized ways of thinking and acting. These practices, we argue here, involve a complex set of actors, events, and relations that significantly condition the acceptance of innovations. As several scholars have argued (e.g. Shove & Pantzar, 2005; see also Taatila et al., 2006), there is a need to achieve a better understanding of the mundane social practices that play a part in shaping the acceptance or rejection of innovations. Therefore, it is the identification and exploration of practices that becomes a key research task in the exploration of acceptance.

3. Materials and Methods

3.1 Data collection

The empirical data for the study was collected through a multi-methodological approach involving individual interviews, focus group discussions, and self-documentation packages. These data collection methods were selected for getting in-depth information about practices, the participants' latent needs, and their attitudes towards bioactive innovations concerning point of care testing within the health and wellness care of humans and animals. The fieldwork was conducted during December 2009 – January 2010. The material of the study consists of the transcribed interviews of 37 participants and three probes (Table 1).

3.1.1 Health care professionals

All the participants in the human health care section were working in the field of health care in Finland. Ten individual interviews were conducted among nurses and doctors using the theme interviewing method. In addition, three focus group sessions covering a total of 10 participants were conducted as a follow-up to the individual interviews. Altogether, 20 health care professionals participated in the study.

3.1.2 Pet professionals

The participants in this special group were pet owners (owners of cats and dogs), pet breeders, veterinarians, and other actors in pets' wellness market in Finland. This sampling strategy enabled us to attain an understanding about the complex set of actors, activities, and contexts involved in point of care testing. Altogether, eight individual interviews and two focus group sessions were conducted with a total of 17 participants.

3.1.3 Probes

The self-documentation packages were provided for three athletes. The athletes represented different sports: running, fitness, and endurance. One of the athletes was a national-level competitor and two were very active athletes. The athletes were asked to record their activities during a measurement period of one week.

3.2 Methods

Focus groups were used to gain group interaction and to put more emphasis on the participants' points of view (Morgan, 1988). To motivate discussion, the concrete product innovation examples were shown to the participants. Also, projective techniques were used to stimulate discussion, to elicit rich information, and to gain access to the participants' conceptualization of practices and innovation characteristics (Colucci, 2007; Moisander & Valtonen, 2006; Levy, 1985). This was accomplished using the personification exercise, through which inanimate objects were brought to life (Colucci, 2007). More specifically, the respondents were first asked to freely describe their relation to pets as well as their mundane practices related to health care and pets. After that, a more focused discussion on point of care testing took place.

The themes that guided discussion in the individual interviews and focus groups concentrated on everyday practices concerning the existing health care products as well as the products of the future. They also focused on the important characteristics, usability, and receptiveness related to product innovations. During the interviews, pictures and descriptions of planned product concepts were used to animate discussion, to get responses, and to elicit their material, social, and symbolic significations (Moisander & Valtonen, 2006). The concrete materialization of innovations helped the respondents to articulate their practices and to bring out the many aspects involved in point of care testing. Projective techniques (Levy, 1985) were also used to gain in-depth insights into the ways in which point of care testing as such was perceived. This interview strategy enabled us to get insights into various pet-related concerns, and into the multiple contexts in which pet-related activities and point of care testing are embedded. It also yielded responses to the innovations in question.

While both the interviews and the focus groups are here understood to produce cultural talk (Moisander, Valtonen & Hirsto 2009), the methods differ in terms of the type of interaction involved in the encounter. Whereas personal interviews involve interaction between the researcher and the respondent, a focus group is essentially based upon interaction between the respondents – the researcher occupying the role of a facilitator. Hence, compared with individual interviews in focus groups, the researcher has less control over the generated data (Morgan, 1988).

In order to sustain discussion and promote equal participation, it is commonly maintained that group participants should have something in common (Boddy, 2005; Morgan, 1988). In the health care case, the homogeneity of the focus groups was based on the participants' professions, and in the case of pets, the connecting factor was pets and the essential part they play in the participants' everyday life.

In addition to interviews, the material was enriched by three probes from athletes. Mattelmäki (2006) defines

probes in the following way: "*Probes are based on user participation by means of self-documentation. The users or potential users collect and document the material, working as active participants in the user-centred design process. Probes are a collection of assignments through which or inspired by which the users can record their experiences as well as express their thoughts and ideas."* The self-documentation package consisted of a diary, notes, open questions, physical objects, and tasks related to the objects. The purpose of the physical objects was to stimulate thinking about different ways of taking a sample. The physical objects were a ready-made and tailored set of fiber-based cosmetic and beauty products. Further, the participants were asked to take photos of the targets they found interesting and to make drawings and notes onto an anatomic figure provided in the self-documentation package, that is, the probe kit.

3.3 Analysis

All the discussions were recorded and transcribed for later analysis. The analysis process started with a close reading of the transcripts by each of the authors: each of them got acquainted with the data individually, outlining notes and preliminary insights. Then, four analytic workshops were organized in which individual interpretations were shared, discussed, and further developed in a collaborative manner. During the workshops, the emerging themes were developed and an interpretive framework was designed that enabled us to carry out a more focussed analysis. This framework was informed by the practice lens, and the part that is discussed in this paper included the articulation of the actors and their roles, events, and contexts. The analytic procedure followed a basic procedure in a culturally oriented qualitative inquiry (Moisander & Valtonen, 2006). Our analyzing process was strongly team oriented (see Olensen et al., 2002) and it was followed by individual analyses where the researchers read the material through in a collectively achieved understanding.

4. Results

In this study, we were concerned with three different cases: health care, pet wellness, and sport. In what follows, we discuss the results of our empirical study. We start by taking up some general insights to our material, after which we elaborate on the results in a more detailed manner.

The data indicate that sensory faculties and symbolic qualities play a significant role in the practice of POCT (see Strati, 2007). For example, the use of blood as a sample carries a range of symbolic qualities. On the one hand, there are many fears related to blood (taking the sample, touching blood, seeing blood), but on the other hand, the use of blood as a sample is perceived as a reliable sign that something is concretely done to treat a case. In the same vein, there are a range of culturally constructed fears and emotions related to the handling of secretions. Hence, the importance of the sensory faculty of touch, and the attendant embodiment, should be carefully taken account when the practice of POCT is analyzed. Actors are, after all, embodied beings that enact in a material and symbolic environment.

"People are usually satisfied when something is done. Especially if blood is used… Customers are happy when we take samples and tell them in concrete terms what they've got."

The material and symbolic aspects related to samples and handling seem to play a significant role in determining whether they are found convenient or not. As a discussion in the focus groups indicate:

"It is not that easy to get urine from a cat." or

"…Something containing bacteria, so that nobody with a bit of common sense would touch it."

Moreover, in the health care context, it was notable that point of care tests were reflected through the medicines and practices used in medicine-based care, as the following comment demonstrates:

"In pharmacies, could they have self-treatment products and next to them something to test whether you have a yeast infection, for instance, and then you could by the medicine."

In the athletes' material, in turn, the desire of athletes to understand the effects of training on the body, capacity, and recovery was highlighted. Athletes often act more independently than patients in the public health care service because athletes do not seek a diagnosis. According to our material, there are also health care experts and personal trainers available for athletes participating in the analysis of test results, and in the existing practices athletes are used to laboratory testing.

"Training response tests have traditionally been made in the lab… It is therefore now difficult to believe that quick tests yield reliable information."

On the whole, it became apparent that the users' habituated ways of doing things play a major role in acceptance. Hence, the question is not of just making a rational decision but rather of doing a familiar embodied act. It may sometimes be hard to accept new ways of working because adapting to change requires effort and more attention

than a known and safe existing practice, as stated in the following quotation:

"Then we have fixed routines, for example, for 15 years we have placed stickers on test tubes this way, but now we place them the other way."

Price, for its part, seems to represent a more rational dimension. Not surprisingly, price was recurrently present in the empirical discussions when novelty was talked about and evaluated, as the following quotes exemplify:

"The price should be close to lab tests or, on the other hand, it should bring significant benefit in addition to acquiring new practices."

"Perhaps price comes along somewhere in the procurement chain… The one pressing the enter key wants to get a cheap and high-quality product; but they seldom come in the same package."

Even though price was discussed, it was often mentioned that it is not the only characteristic affecting a decision; rather, it was the balance between costs and benefits that mattered.

4.1 Existing practices in human and pet health care and wellbeing

We have recognized five different stages among the present practices of laboratory testing in human and pet health care (figure 2). The stages are seen as events and they are named as follows: 1) impulse, 2) sample, 3) handling, 4) analysing, and 5) decision (Alakärppä, et. al., 2010, Valtonen, et al., 2010). This treatment highlights that acceptance does not take place in a vacuum, but rather in a certain social, cultural, and also economic context. In our case, the general context is point of care testing as well as human and pet health care and wellbeing. The practices in our model are sets of events situated in the social and material contexts in which they take place.

4.1.1 Events

Events form the basic unit in our framework. An event consists of all the emerging routines and contextual variables and all the driving forces for action in a certain operation. Events are context dependant and thus have a dynamic nature. Hence, we can not explicitly define the universal characteristics of an event. However, in our case the names of the events represent one of the key elements of an event – motivation. Our concept of events has similarities with the *Sectoral Innovation Systems* model (SIS), in which a sector is defined as *"a set of activities that are unified by some linked product groups for given or emerging demand and that share some common knowledge" (*Malerba & Mani, 2009*)*. In the SIS model, there are also several actors ranging from the individual level to a collection of organizations. The organizational level includes both commercial and noncommercial organizations.

Impulse refers to the idea that there is a need to take a test, so it can be seen as the motivation to do something. The source of the impulse varies; it can be actualized by the nursing personnel or by a patient's relatives, for example.

"The doctor was surely supposed to know the bacteria growing in there."

"The aim of breeding is always to get healthy animals."

The motivation could arise, for example, from a need to get information on nutrition balance or on the amount of a certain trace element in the body. In both cases, the target is the human body but the motivation is different. Athletes may train hard and want to know how their efficiency is improving, whereas in case of POCT in human health care, the users are interested in health-related issues. Accordingly, in the pet case, the motivation is to have good results from breeding as the following comment shows. *Sample* refers to the actual operation needed in taking a test; for example, the way a urine sample is taken and used in a test.

"You place a small jar there and spread the legs and put a glove on and place the jar under it to get some in the jar or a bit on the hand as well."

Handling, in turn, covers the process of indication and the operations of keeping the sample clean and identifiable. All the previous operations lead toward the *analyzing* event.

"When I take a blood sample I send them, I mean also the basic blood samples made at the health care centre, so, I send them elsewhere and they fax me the answer on the following day."

The analyzing event covers all the operations required to achieve a valid result from a sample. The last event is to make a *decision* on whether operations or medication are needed.

"During out-of-hours duty the laboratory is not operating; then these quick tests would work fine, they could even be done by personnel with less education. So, you could then decide whether to send a patient to hospital or not."

It must be noticed that there may be more than five events in the most complex practices, and, vice versa, in a

simple practice there might be less than three events. The identified events can take place at the operative and strategy levels. The benefit of the two-level distinction is that it directs attention both to the actual practices of those who carry out a test (see Orr, 1996) and to the decisions that either start or close an array of events. In doing so, it brings to the fore the multiple forms of events that are involved in the acceptance of or resistance to a point of care innovation.

4.1.2 Actors

In all cases there are several actors and thus varying motivations. We have previously recognized five key actors and roles around the existing laboratory and point of care tests: 1) patient, 2) executive, 3) tester, 4) analyser, and 5) manager (Alakärppä, et. al., 2010, Valtonen, et al., 2010). It is worth noticing that the actors should not be seen as single individuals but rather as roles which can be played by a person.

In the case of human health care, the object is the individual who is under treatment. The executive is the person who makes decisions on behalf of the patient before the test or it can be the person carrying out operations after the test. The tester is the actor who executes the point of care test. It can be the patient, a relative, a nurse, or a doctor, depending on the context. The analyzer either works in the laboratory or performs a quick analysis at the location of the point of care test. The manager is responsible for the actions done during the care or after the test.

In health care the manager is a professional, the patient, or sometimes the patient's representative. In the context of sport, the manager might be the athletes' coach as well. The pet's case is different, as the position of the actor steers the actions many ways. Therefore, the case of pets is highly complex because different actors may occupy overlapping positions: often a vet is also a pet owner or even a pet breeder. The responsibility of the veterinarian is based on medical education, whereas the breeder's responsibility is to make the particular breed develop further. The regular pet owner, on the other hand, is responsible for the animal he or she has chosen to make a family member. The differences between the responsibilities bring about tensions between the different actors; they also create divergence in opinions regarding the question whether point of care tests should be available for everyone, including breeders and regular pet owners. In the case of pets, the patient is an animal. The pet owner is the executive who makes decisions on behalf of the animal. As with human health care, the tester is an actor who performs the test, that is, prepares the animal for the test and takes the sample. The manager is either a vet or a pet owner, or some other person taking care of pets.

4.1.3 Innovation characteristics

According to Ehrmeyer and Laessig (2004) the traditional quality attributes of point of care testing are: accuracy (traceability), precision, reliability, quality control, and data interpretation. We found several innovation characteristics (IC) contributing to innovation acceptance. The most important ones were: reliability, speed, cost efficiency, usability, and ecology (Figure 3). The innovation characteristics join fixedly with events and they are prioritized in different ways by the actors. Thus, the evaluation is deeply dependent on both the actor and the context.

Reliability was considered a relevant and essential feature of POCT, and it forms the basis for using the tests. Accuracy may change from case to case but reliability must be present in all cases. *Speed* refers to the time of taking a test and the time of getting the results. *Cost efficiency* was defined here as the amount of money or recourses spent on the whole process of taking a test, including the price. The characteristics related to ease of use were important and referred to here as *usability*. The following comment shows one ecological issue that was taken up in the discussions:

"There are heaps of garbage…not only from quick tests but produced by the hospital in general… Everything is disposable."

Ecology was present in the discussions and considered an important characteristic. Ecological issues are gaining popularity in hospitals but they are not yet implemented in their practices even though the nurses recognized several ecological problems in hospitals and health centres.

Innovation characteristics are evaluated through the rules set by every individual actor and by the social and cultural conventions upon the event. A single actor may have several roles in an event; actually, the same person may appear in all five roles. Even if the person is the same, his or her focus of attention varies depending on the role. Thus, also the evaluation criteria vary on the basis of the roles. As the following two comments indicate, the innovation characteristic *speed* is conceived in different ways by health care professionals.

"In outpatient treatment, people are in a better condition and can wait for a day or two for the results... But in special health care they do need them right away."

"Well, I guess it's the price and then it should be easy to use and, well, based on the result it's kinda easy or fast to draw some conclusions then…"

A speedy test means that the results are received during a period ranging from a few seconds to a couple of hours.

4.1.4 Acceptance

When discussing acceptance, it is possible to consider it just as an instrumental issue. We start using a device and get either a favorable or a non-favorable reaction. But if we start thinking about what happens when a new technology or system is used in a new situation, we may see several actors, dynamics, and multidimensional factors contributing to acceptance. Acceptance can be examined as a phenomenon tied to the moment of introducing or selling a product. Another possibility is to examine the issue as a continuous user-product relationship, in which acceptance is part of the user experience. This option enables us to understand the dynamic and multidimensional nature of acceptance (Figure 4). It is argued that this might be more important than an intention to recognize the reasons for a negative attitude toward new technology (Joseph, 2010).

Our discussions revealed that the attitudes of the laboratory staff were against POCT; it seems that the roles of professional groups and conflicts between them may affect the approval of innovations in organizations. As the following comments from our data show, acceptance is also related to power, resistance to change, and conflicts between professions. This is parallel with the results presented by Coghlan (1993).

"I'm a bit against the possibility to buy tests at pharmacies because there may be a problem that people demand medicine or don't bring their pets to the vet.."

"As you probably noticed, we're not used to it. We ourselves are kind of jacks-of-all-trades and try to be everywhere; this is also a responsibility issue, perhaps we'll have to get used to it."

4.2 A new point of care testing practice based on bioactive paper

The key benefit of bioactive technology is that it makes it possible to design point of care tests that have fewer events than the existing ones. When entering the health care market, the new point of care tests will replace the existing ones or create new practices in the field. The following comment illustrates how bioactive point of care tests could change the existing practices:

"It's always such a hassle that you've got unfinished work… and these calls and errands have to be handled… If we could get the result there and then tell the patient right away, then money, time, and effort would be saved."

In many cases of bioactive POCT, the handling and analysing events are no longer clearly separated because they are integrated. This creates a new practice in which the nursing personnel and the patient have more power and responsibility. As a result, the innovation characteristics, or more specifically, the way they appear or are manifested to the nursing personnel or to the patient, must be carefully considered. In order to enter the health care market it is crucial to understand the roles of the different actors participating in events within the practices of POCT.

In the above hypothetical bioactive practice (Figure 5), *the impulse* is the first step of a test. The impulse for bioactive POCT can be given for example by a health care professional or by an individual outside the health care environment. The *sample* is a very important event in many ways; as a concrete issue it is an essential component of bioactive testing. On the other hand, the sample event is an important signal for the patient that something is happening and that he or she is receiving treatment. Actually, without the sample event, the ensuing *decision event* assumes a very different nature. If a sample is taken, the decision event entails mostly discussion about the results of the POCT and about the future steps in treatment. When considering wide-scale usage of bioactive POCT, one should observe that a new POCT practice would change the decision-making processes and thus reform the balance of the existing routines in the human and pet health care and wellness market.

4.3 A practice-based framework for innovation acceptance

The Bioact innovation and its characteristics play an important part in achieving user acceptance. Our results outline two different strategies through which to enter the market: by creating a new practice or by linking to existing practices. Innovation characteristics are not evaluated only as concrete features of an innovation. Instead, they are reflected through the existing practices in the field. Consequently, it may be enough in terms of acceptance if a single innovation characteristic works better in a new practice than in the existing practices. An innovation may create a new practice, and in that case the user compares the innovation's characteristics with the sacrifices required by it.

"If a customer has an appointment, he or she always pays the same fee regardless. So, the quick test should be

cheaper than the visit… It removes the terrible trouble, however, that you don't have to take it to the post office, and that's it then… On the other hand, if it took a shorter time, the fee could be lower because there's less work."

As Shackel (1991) states, the user compares the product's usefulness, usability, and pleasantness with its costs and thereby chooses the best alternative. Our data support this view as the previous comment from the focus groups indicates.

We found six constructs that appeared to be of significance to innovation acceptance (Figure 6): actor, innovation characteristics, event, existing practice, new practice, and continuous use. In this section, our theoretical model is presented and the interactions between the main constructs are described more in detail.

Actor is defined as an active player involved in the process of usage. A single actor may have several overlapping roles while using a technology. Hence, the perception and evaluation of the innovation characteristics are affected by the actor's role. Moreover, as the actor is necessarily an embodied being, the corporeal and sensory aspects play a key role in acceptance. The relation between the actor and the innovation characteristics (r1 in Figure 6) is thus complex, dynamic, and reciprocal. This dynamic interaction is actualized in the next stage, referred to as *event*. *Innovation characteristics* are defined as sensible and perceivable features of an innovation, differentiating it from other innovations. Innovation characteristics form the core of an innovation, encompassing aesthetic, functional, physical, economic, symbolic, and cultural characteristics. *Event* is defined as the routines and contextual variables of a practice and all the driving forces taking place in the event. The relation (r2 in Figure 6) between the innovation characteristics and the event includes both the actor and the features related to the innovation characteristics as well as the way in which they appear or are put into practice in the event.

There are two options for implementation (r3 or r4 in Figure 6). Actions performed in an event may become part of an *existing practice* or they can lead to *a new practice* (r4 or r4 in Figure 6). *Existing practice* is defined as a set of events consisting of existing, well known routines and ways in which activities are performed to achieve a goal set by the actor. In the first option (r3), the event does not change the existing routines of the event. Hence, the interaction between the actor and the new innovation just replaces old tools or instruments used in the event, thus providing the user with better performance or some other benefit.

New practice is defined as a set of events consisting new routines and the ways in which activities are performed to achieve a goal set by the actor. The relation between an event and a new practice (r4 in figure 6) is complex as a new practice is created through the actor, innovation characteristics, and event. Thus, it may face challenges such as resistance or conflicts between professions. There are also interconnections between a new practice and an existing one (r5 in figure 5), as the new practice may be linked to existing ones and vice versa. The connection is dynamic due continuous development; a new practice becomes an existing practice within a certain time period. This transformation is indeed interesting, and it might provide a seed for understanding the multidimensionality of the acceptance of practices.

Based on our study we propose that innovation acceptance, and hence *continuous use,* is built on the willingness of users to bring technology into their existing practices (r6) and on the appropriateness of the technology to user practices and their social and cultural environment. Yet, affordance for new practices (r7) and users' ability to adapt to new innovation routines seem to be important. But a more challenging issue is to define the formation of new practices through the dynamic interaction of innovation characteristics, actors, and events.

5. Conclusion

On the whole, this study contributes to the existing innovation management literature by way of providing, through a practice lens, a more nuanced understanding of the way innovation characteristics play a role in the adoption process. This paper provides new strategic understanding about the ways in which the concept of practices might be applied when trying to supply innovations and services to a market. More specifically, it suggests that innovation characteristics should be considered to be dynamic in the sense that their significance varies according to the context.

In the next subsections, the conclusions are discussed by answering the two research questions presented at the beginning of this paper, and finally, the theoretical and managerial implications are discussed.

5.1 Existing practices in the human and pet health care and wellness market

The first research question was defined as follows: *What kinds of practices exist in the point of care testing of people and animals?*

We identified several practices concerning human and pet health care. We also recognized practices dealing with

hygiene, team work, and multiprofessional cooperation. In this study, we have concentrated on the practices of point of care testing. A common denominator was the context-dependency of the actions and actors involved in the practices. We found five key actors (patient, executive, tester, analyser, and manager), all of whom play different roles and subsequently possess different resources, depending on the context. In addition, different kinds of motivations for actions were found. The importance of understanding the motivation behind actions and its effect on innovation acceptance stood out in the discussions. For the producer of an innovation, it is vital to recognize the one who actually has the power of making decisions in an event. This information is essential to be able to deliver the correct message to the relevant decision makers.

5.2 The effect of innovation characteristics to innovation acceptance

The following is the second research question: *What is the effect of the identified practices and innovation characteristics on innovation acceptance?*

We found several characteristics, of which the most important ones were reliability, speed, cost efficiency, usability, and ecology. The importance of these characteristics varied, though, in line with the actors and rules, and therefore they should be considered context-specific rather than fixed. An innovation characteristic is a perceivable feature which makes a difference as compared to another innovation. Hence, it has a significant role for acceptance. In our study, we found *reliability* as the most important innovation characteristic. Without proper reliability, point of care testing is useless. For example, if we consider entertainment in the context of bioactive innovation, the innovation characteristic does not make sense, whereas excitement could be useful instead. This simple example shows how context-dependent innovation characteristics are. As a conclusion, we can say that innovation characteristics have an effect on innovation acceptance, but they should be seen as contextual constructs.

5.3 Theoretical implications

This subsection contributes to the first main task of this study. We aimed *to modify the framework of the practice-based approach for studying the acceptance of an innovation.* The empirical context of this study deals with human and pet health care and wellbeing. Literature on technology acceptance and practice has been used to bring the related concepts and viewpoints into the research of innovation adoption. As a conclusion, we can say that our studies on bioactive innovations underscore the importance of understanding the context of usage and all the relevant stakeholders and constructs – actors, innovation characteristics, events, existing practices, and new practices – when entering the human and pet healthcare and wellness markets.

We have presented a practice-based framework for the adoption of an innovation highlighting the role of events in practices as well as their interaction with actors and innovation characteristics. Against this background, we believe that we have taken the first steps into a research area largely neglected by previous studies.

There is still much room for further study on rational and irrational reasoning influenced by new technology and innovation. As we were not able to study the bioactive innovation in actual use, the framework presented here should be studied in the context of practice. Yet, in the future we should direct more attention to issues related to the symbolic meanings of technology and to the ways in which material form and appearance contribute to acceptance in real-life usage settings.

5.4 Managerial implications

Our second main task was *to formulate a strategy and practice-based guidelines for entering the health care and wellness market for humans and pets.* Thus, in addition to the theoretical contributions described, this study provides new insights into practical innovation management, innovation measurement, and health care innovation systems.

To sum up, and to contribute to the second main task, we propose the following general guidelines on what should be considered when entering the new point of care testing market.

- Consider carefully the context of use (practices and events) when constructing a message for the customer.
- Notice that a new innovation may generate power-related concerns, resistance to change, and conflicts between professions in the creation of a new practice.
- Figure out who has the power to make decisions on events within practices.
- Map the innovation characteristics according to the roles of the embodied actors and consider what is important to them.

- Communicate clearly the superiority of the innovation with respect to the existing ones.
- Notice the symbolic and sensorial aspects of the sample used in the POCT.
- Make sure the innovation is actually adapted and tailored for everyday use.

The key finding of managerial relevance is that managers must recognize the impact of the existing or emerging practices of the market to the adoption of an innovation and the overlapping roles of the actors in the field. Finally, our results indicate that innovation characteristics are valued in a certain context and that adoption behaviour does not occur in a vacuum but rather in a changing social and cultural environment.

Acknowledgements

This work was done in the BioAct2 project funded by Tekes – the Finnish Funding Agency for Technology and Innovation. The authors also wish to acknowledge the financial support of the following companies: UPM-Kymmene Oyj, BASF Oyj, Tervakoski Oyj, Orion Diagnostica Oy, Hansaprint Oy and Oy Medix Biochemica Ab.

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Table 1. The material of the study

		Interview	**Focus group**	**Probes**	**Total**
Gender	Male	2	5	1	**8**
	Female	16	14	2	**32**
Total		**18**	**19**	**3**	**40**
Position	Doctor	1	4		**5**
	Nurse	9	3		**12**
	District nurse		3		**3**
	Veterinarian		3		**3**
	Pet owner	6	6		**12**
	Pet proffisonals	1			**2**
	Athlets			3	**3**
Total		**18**	**19**	**3**	**40**
Age	Over 50	4	2	1	**7**
	41-50	6	5	1	**12**
	31-40	5	3	1	**9**
	21-30	3	9		**12**
Total		**18**	**19**	**3**	**40**

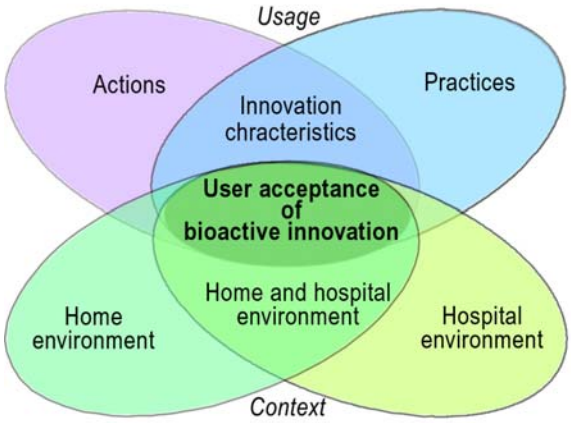

Figure 1. The framework of the study

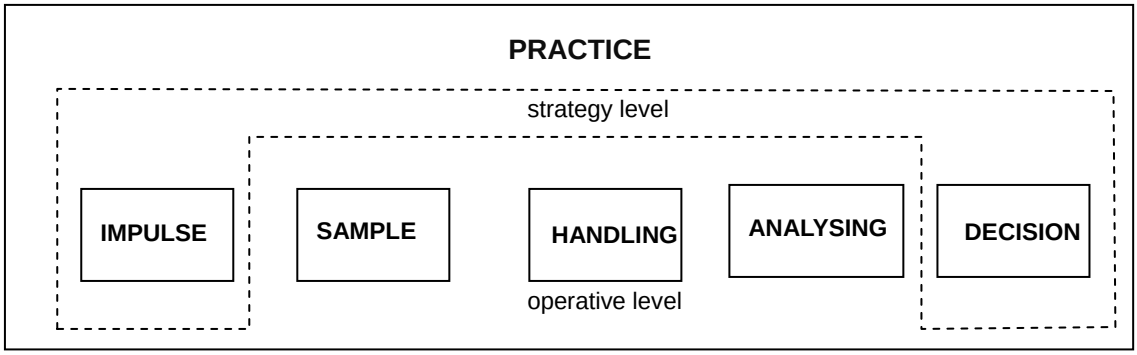

Figure 2. Events in the existing POCT practices

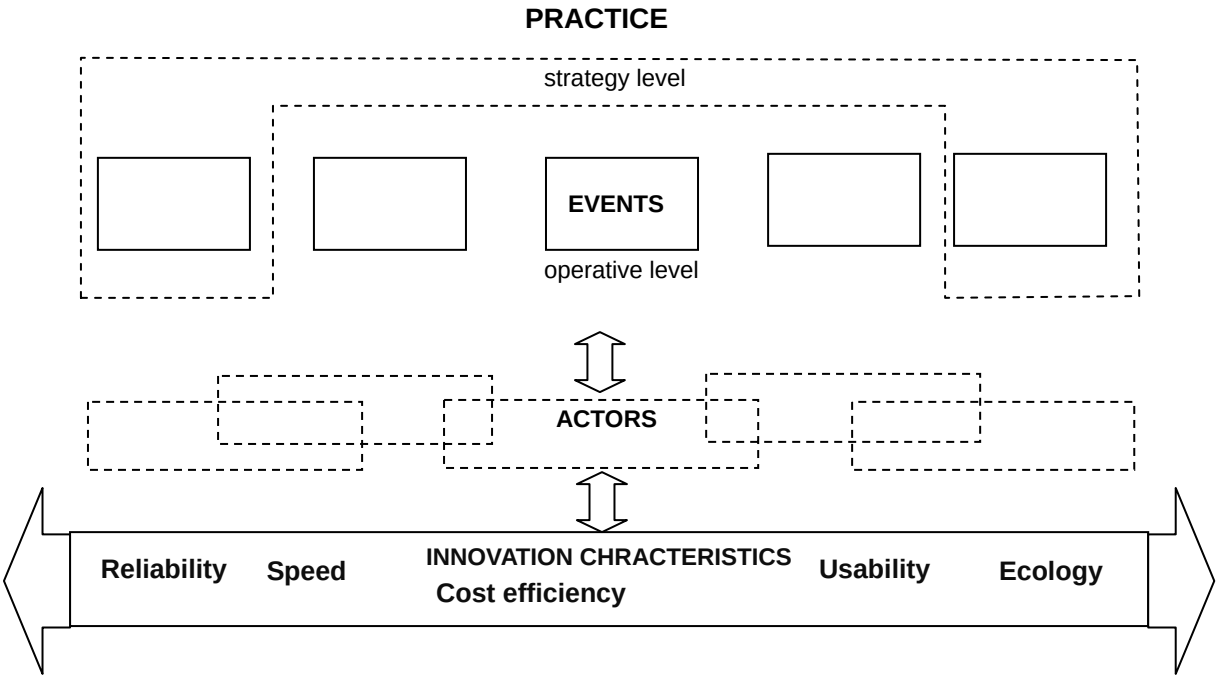

Figure 3. Innovation characteristics

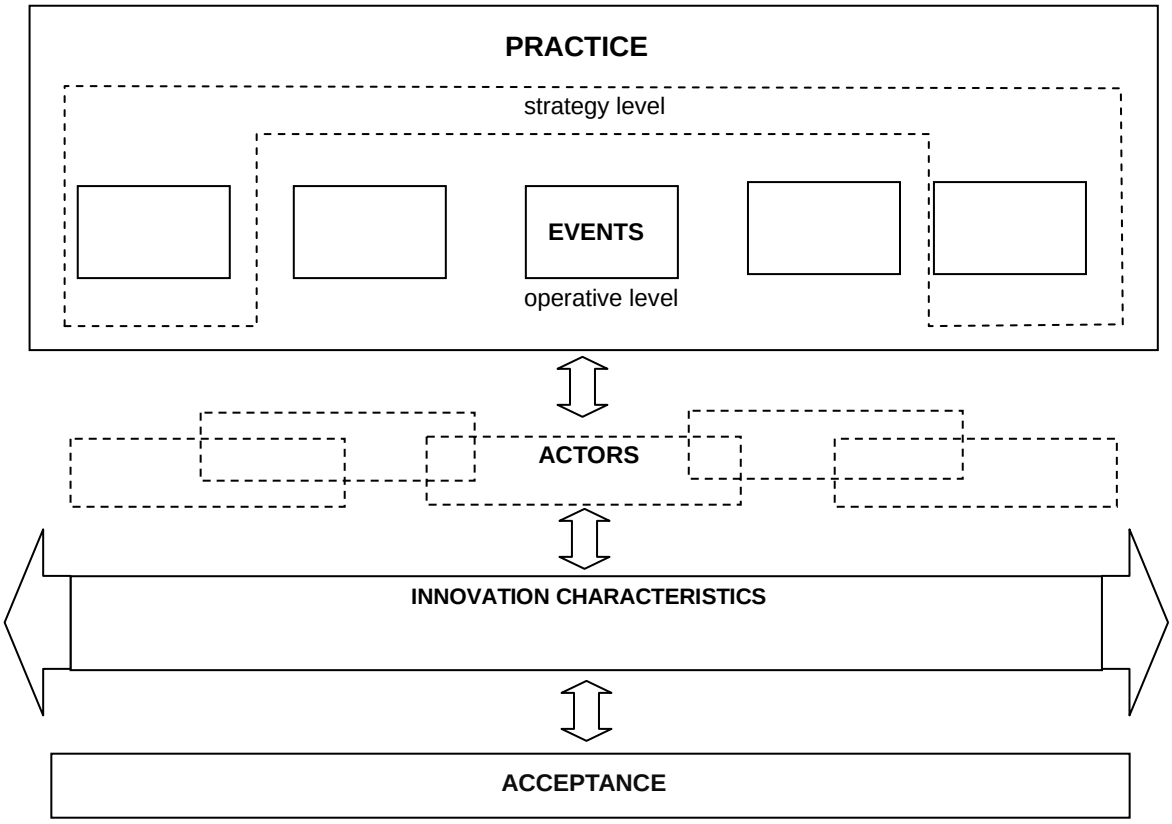

Figure 4. The basic components of the practice-based approach in the study

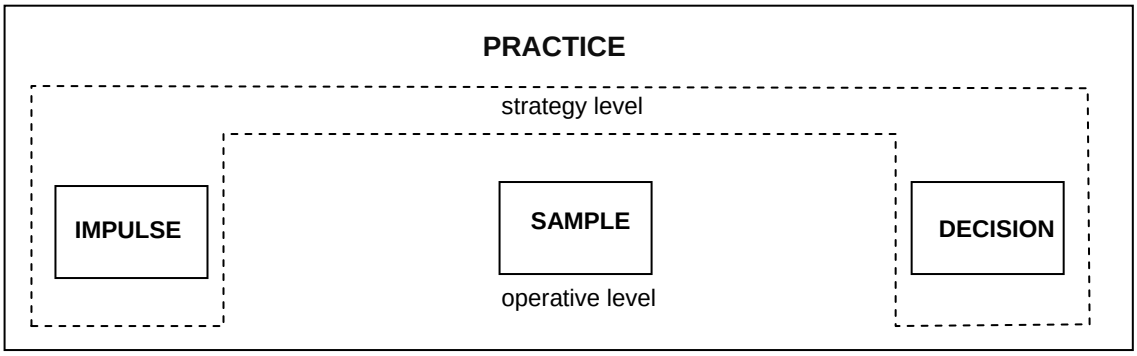

Figure 5. Hypothetical bioactive POCT practice

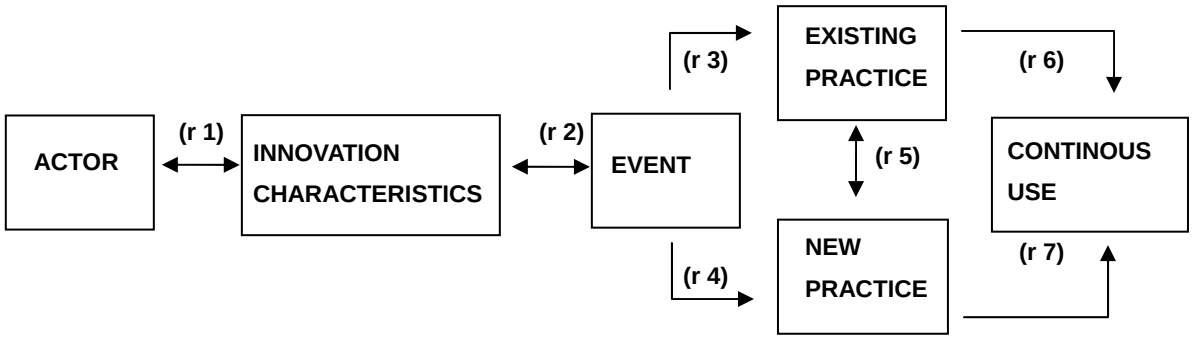

Figure 6. A practice-based framework for the adoption of an innovation