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Editorial

The power of technology: A Fact or Fiction for Majority?

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This Fall Issue will discuss about the power of technology and Internet. Innovation is taking place everywhere through new and emerging technologies changing the way we think, live, breathe, travel, and do shopping to name a few areas. Funny enough is that some of us believe that the most important technologies are on the market available to please customers and users, and nothing more important will show up later. We, as humans, systematically underestimate the power of technology and its impact on daily life. There are several well-known quotations from very smart people which have turned ridiculous after some time by basically shifting initial assumptions into market knowledge. Whatever is too expensive and complex today becomes a commodity in no time and shortly after doesn't bring competitive advantage any longer (the S-curve effect, see e.g Bayus, 1998 or Rogers, 1962, for different explanations). Several notable studies illustrate (like the well cited and used BCG tools) how rapidly diffusion is influencing production costs and consequently, accelerates the speed of diffusion itself. The question here stems from where the balance between the minority of 'crazy' developers and the majority of pioneering consumers willing to try something new lies.

This Issue brings about some knowledge and insights on the power of technology and how it can be seen through the development of Internet, with an ever increasing accessibility and usage of it. Internet of Things is a hot discussion topic today. We have seen some 'crazy' developers in the market, but apparently the big boom will be coming later. For sure, the potential of Internet of Things is great, but its exact realm and extend of applications and potentialities is still to unveiled, and implemented in practice. Pioneering companies will certainly gain some advantage, yet the unanswered question is when. We have agreed quite some time ago that Open Innovation (OI) is a shift in innovation management paradigm, and it concurrently occurred with the advent of Internet. Twitter, one vehicle of using bigger and bigger majority can be seen as OI enabler. Co-creation and crowds became popular concepts and innovation practices, only after a majority of people joined the Internet. The extent of openness at individual, team, inter-organizational or organizational levels is yet to be debated in academic literature and in real life. The pace of diffusion of technologies raises new concerns for organizations, as they have to selectively choose their communication channels, need to align their digital footprint with their strategy and operations in a contingent manner, and optimize their positioning in either minority lead users leagues or majority adopters pools.

In the first Letter of this Issue, Datta portrays the economic, financial and social frictions that the third industrial revolution, consisting in the connection of physical world objects and information, will trigger. In his view, the Internet of Things will simultaneously bring about myriads of opportunities as well as rising inequalities,

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requiring economic re-equilibration. The Scholar further highlights the need to "tune the engine of education", asserting that it would be deplorable to have smart cities without smart citizens. As Social Media are strongly present in this Issue, we would like to virtually tweet his assertion, "humanity needs dreamers and education is quintessential salt which acts as the purveyor of inspiration, imagination, invention, innovation and drives implementation of ideas", and like it.

The Policy Letter by Ruiz-Alzola focuses on the transformative power of services, and depicts how a smart specialization strategy is implemented to boost the economic competitiveness in an outermost region of the European Union. This Letter also caters for lessons learnt from the implementation, as well as the suitability of these policies in the particular setting of the Canary Islands.

The first academic paper of this Issue explores the cultural basis of innovation, through the interpretivist research paradigm. The empirical setting consists of four companies, which have been appraised as having the most innovation-supporting culture by members of the Australian Information Industry Association. The study unveils interesting features about the leadership practices endorsed in these innovative firms, namely risk-taking experimentation, eliminating any fear or speaking up, facilitating "creatively abrasive" interaction and celebrating failures as a manifestation of appropriate risk-taking. Organizations under scrutiny have also been found to have developed a culture characterized by collective humility, trust, and without personality games, hubris, ego clashes and other forms of destructive politics. Culture creation or transformation is unveiled to be a critical leadership task in organizations which strategic intent is to innovate, as concluded by Burdon and Dovey.

In their contribution, Jaring et al. examine the role of Twitter to accelerate the marketing of two software applications. Their findings uncover some key challenges, such as the current inability to determine a priori who is a useful follower, as well as the lack of predictability regarding retweeting behavior and viral spread of tweets. The Authors derive managerial implications from their case study, and conclude on the need for a common understanding to handle a shared Twitter account, as well as the full grasp of its behavioral style.

Heikkilä and Antikainen explore the co-creation process of new financial management services and gain insights from five case studies involving small business owners from several industries. They discuss the benefits and challenges inherent to the co-creation process, concentrating on the "design with customers", as one of the steps representing the different levels of customer involvement in the new service development process. Their findings unearth the potential of gamification, social aspects, mobile usage and portability, and visualization as avenues for new financial management services development.

Opening up further the innovation process to external inputs, Saur-Amaral presents a systematic literature review, embracing both academic and non academic contributions revolving around the "wisdom of the crowds" and "collective intelligence". Based on her reviews, the Author concludes on the necessity for each organization intending to use crowdsourcing as a component of the distributed innovation management strategy, to master a few essential processes, including among others, the a priori definition of the role and impact of the crowds on the organization's strategy, the understanding of the motivational drivers of participants in the crowdsourcing initiatives, and the use of metrics to evaluate crowdsourcing success.

In their contribution, Dufour and Son scrutinize open innovation in SMEs. So far, and with a few notable exceptions, empirical settings for open innovation studies have been mainly large multinational companies. Yet, research and practice are nowadays

increasingly other environments to explore the phenomenon and its multifaceted reality. Relying on a single case study of a sports equipment company in Sweden, the Authors elaborate on the role of corporate culture, networking, organizational structure and knowledge management systems in the adoption and implementation of open innovation practices.

Concluding the Academic Papers section of this Issue, Bergset and Fichter discusses the peculiarities of green start-ups and the specific financial challenges and opportunities that they may encounter. Their conceptual contribution puts forward a new typology of green start-ups, building upon three main dimensions, i.e. product-related, entrepreneur-related and strategy-related characteristics. They further discuss the features, opportunities and challenges of the alternative, visionary, inventive, eco-preneurial and unintentionally green start-up types. This typology paves the way for further empirical research on green start-ups, which embody one of the key components to achieve green growth objectives.

This Issue finally hosts a review of the collective volume entitled "The Entrepreneurial Rise in Southeast Asia, The Quadruple Helix Influence on Technological Innovation", edited by Sindakis and Walter.

This Issue has unearthed some features of the power of technologies to support and foster innovation, and its heterogeneous and multifaceted nature. We wish you a stimulating journey in your reading of this issue of the Journal of Innovation Management.

Innovatively Yours,

Marko Torkkeli, Anne-Laure Mention, João José Pinto Ferreira
Editors

References

Bayus, B. (1998) An Analysis of Product Lifetimes in a Technologically Dynamic Industry, *Management Science*, 44(6), 763-775.

Rogers, E. M. (1962). *Diffusion of Innovations*, Glencoe: Free Press. ISBN 0-612-62843-4.

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Dynamic socio-economic disequilibrium catalyzed by the Internet of Things

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Letter from Academia

The technology based conceptualization of the internet of things (IoT) and the industrial internet may have started circa 1988 with the work of Mark Weiser of Xerox Palo Alto Research Center who suggested that computers may *"weave themselves into the fabric of everyday life"* and influence the future of business, as a consequence (*Scientific American, 1991*). The knowledge base Weiser was referring to is the discussion by Herbert Simon in his 1987 paper "*The Steam Engine and the Computer: What makes technology revolutionary*" where Herbert Simon frames his thoughts about the computer, "*you have to make friends with it, talk to it, let it talk to you.*"

Hence, contrary to the media hype, in progress, the vision of the Internet of Things (IoT) and its meaning did not germinate from a presentation (Ashton, 2009) at a retail product manufacturer. In 2000, the seminal paper entitled *THE NETWORKED PHYSICAL WORLD* (MIT-AUTOID-WH-001) gave birth to the concept of the IoT (Manyika et al., 2011; Sarma et al., 2000) and the evolution of the industrial internet. Facts about IoT as well as the name "internet of things" (The MIT Sloan CIO Symposium, 2013) was discussed at a recent symposium at the MIT Sloan School of Management.

Connecting physical world objects (made of atoms) with information (packaged as bits) may segue to another revolution, predicted by many, among them, Neil Gershenfeld. The current wave is often referred to as the third industrial revolution, in relation to the Information Age (second) and the first Industrial Revolution. In some quarters, the present trend is (also referred to as Industrie 4.0) the age of cyber-physical systems (CPS).

Revolutions are supposed to reshape things to come. The third wave will be no exception. It will generate friction, both social and economic. The clash of status quo with business not as usual. The collision between the imaginative versus those whose imagination is out of focus. The asphyxiation from old world ideas versus geographically-agnostic unbridled innovation unleashing the wizardry of technology to leak into our lives.

Pundits, market observers and industry players are divided over their belief regarding the transformational capabilities of technologies and the ubiquitous connectivity IoT necessitates. Social friction is erupting from erosion of privacy in its conventional format and the redefinition of privacy which challenges old world beliefs. There is justifiable concern about security yet there is measurable reluctance to give up the benefits associated with either. Financial friction is evident both in industrial nations

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and emerging economies whenever unskilled labor is a part of the workforce. Labor, in general, abhors automation, which shrinks the demand for unskilled labor and creates a negative impact on the economy and society, as a whole.

But these are not new observations, in fact these are centuries old and will be repeated over and over, again, albeit in different shades. According to economic historian Norman Poire, "the five centuries that span the years 1440 to 1939 were among the most dynamic in all of history. Many technological advances surfaced during that time, but three inventions stand above the rest as turning points in the direction of technology that led to decisive social change. The invention of the printing press by Johannes Gutenberg in 1440 spurred the arrival of the Information Revolution that spread the Renaissance throughout Europe. In 1609, Galileo Galilei's telescope ushered in the Scientific Revolution and the Age of Reason. The Industrial Revolution and Marxism arrived shortly after James Watt unveiled his steam engine in 1769. In 1939, a fourth technological revolution began. In that year, John Atanasoff and his graduate student Clifford Berry invented the electronic digital computer and unwittingly with it the Second Information Revolution." A little less than century later, we are on the cusp of yet another sea of change.

The Third Industrial Revolution may spur the grand convergence of the industrial revolution with the information revolution and other existing unknowns.

Erik Brynjolfsson and Andrew McAfee at the MIT Sloan School of Management (Center for Digital Business) talks about the frictions that may surface from the third revolution, namely, higher unemployment and rising inequality (*Race against the Machine* and *The Second Machine Age*). The incisive insight about inequality may be also found in the works of Joseph Stiglitz (*The Price of Inequality*) and Robert Reich (*Inequality for All*).

Brynjolfsson and McAfee revisit the discussion of higher unemployment which John Maynard Keynes described as "technological unemployment" in the 1930's. Robert Frank revisits the same topic as technology-catalyzed "winner takes all" labor markets in 1990's and also in his book *The Darwin Economy*. Brynjolfsson and McAfee expect "our world will prosper on the digital frontier" but what about the path to the frontier? The road ahead is fraught with feuding nations, malnutrition, dysfunctional sanitation, inadequate education and poverty of energy. Taken together, these factors are already fueling glaring socio-economic frictions which may be exacerbated by the attributes necessary for the global diffusion of IoT (internet of things).

The fruits of IoT will depend on our ability to interoperate between systems, objects and devices in different environments supporting different standards of operations, protocols and applications. It is impossible to expect that the world will strive to support one common standard. Hence, not standardization *per se* but the *interoperability* between major standards will be the key to diffusion of the products and services of the IoT and the industrial internet which reaches into the domain of all things mechanical. Industry leaders must enable open standards for interfaces (APIs) where products from SMEs can plug into a common global bus to access the connectivity and add their value added services, analytical engines or enhance niche applications. The *systemic* deployment of open connectivity backbone is central to data acquisition and the spread of IoT.

Ultimately, the ability to extract intelligence from data will drive the value proposition of the connectivity. Transaction cost economics (*The Nature of the Firm* by Ronald Coase, 1937) of connectivity will determine the return on investment which will influence business adoption.

The emphasis on low hanging fruits, short term return, prevalent in the business world, may impact the extent of acquisition of data. Inadequate investment may limit

the tools necessary to accumulate critical mass of data. However, without sufficient data, the analytical tools may stumble to unlock hidden patterns in the data. The latter is necessary if real time dynamic analytical engines (at the edge and core) may be one path to monetization of IoT. New sources of revenue may be created from micro-payments based on pay-per-analytics model of information arbitrage which will use intelligent predictive analytics to augment decision support for semi-autonomous activities.

One lesson in data acquisition and analysis may be cryptic in the classical experiment in quantum mechanics described as Young's double-slit experiment. A variation of the experiment was performed at HCRL (Hitachi Central Research Labs) by Dr Akira Tonomura (1942-2012) which revealed (HITACHI, 2015) the build-up of interference pattern from single electrons but it was not observed until sufficient electrons were allowed to pass through the slit. The lesson from this experiment for business is obvious – running pilots and experiments on small scale may not offer appropriate outcomes or provide wrong indications because you cannot construct an elephant using the mouse as a model. This work is insightful because it suggests large scale deployments may be the key to extracting the value and significance of the tools and technologies which, when combined and converged, may provide solutions.

One lesson may be found in the history of general process technologies, in particular, the strategies which enabled the spread of electricity (*The Economic Future in Historical Perspective* edited by P. A. David and M. Thomas, Oxford University Press, 2003). Clayton Christensen's (*The Innovators Dilemma*) 'disruptive' is a hype based on the original concept of general process technologies (GPT) introduced during the era of electrification to indicate systemic integration versus "slap-on" *ad hoc* usage. Christensen mis-used the word and mis-led the business world using poor data analysis to suggest everything is disruptive.

We have observed for the past 15 years the lack of systemic integration of RFID. As a consequence, we have not sufficiently profited from the ability of RFID tags to acquire sufficient high volume data from a systems approach. As a result, we may have failed to deliver adequate transparency within supply chains and the savings from the value chain remains far below what was anticipated. The lessons from the abandoned RFID initiative at WalMart (*Is RFID dead?* Florian Michahelles [2010] Auto-ID Labs St. Gallen, ETH Zurich) is not a failure of the technology but an inadequate use of data tools in the *context* of the business process.

IoT (internet of things) may learn from the history of electrification and RFID in order to find better ways to progressively penetrate our daily reality through systems integration, connectivity and applications. IoT must evolve from things to internet of systems (IoS). Connectivity between the ecosystems of systems may create the next tsunami of profitability. In turn, it will generate even more clamor for security, privacy, trust and ethics related issues on our social policy agendas. IoT connectivity and communications with objects and processes will change the way we interact and behave in our personal and professional lives in the IoS era.

The pursuit of autonomy in healthcare, transportation and manufacturing will create new solutions, old headaches and germinate new business models. The prediction of cancer at least a decade before it affects you, is not an illusion. The autonomous vehicle that parks itself and a freight truck that delivers cargo without humans in the loop is yesterday's news. The death of inventory and birth of distributed manufacturing on demand (dMOD) at the edge (dMODE) is the embryonic Manufacturing 5.0 catalyzed by 3D printing. From heart valves to nano-satellites and from NASA-guided soil moisture active passive (SMAP) guidance for precision farming and graphene-purified arsenic-free desalinated drinking water and everything euphoric in between (neurosynaptic web and neuromorphic chips), we have already begun the next 100-year journey.

According to Jeff Immelt of GE, "in the future one expects an open, global fabric of highly intelligent machines that connect, communicate and cooperate with us. The Industrial Internet is not about a world run by robots, it is about combining the world's best technologies to solve our biggest challenges. It is about economically and environmentally sustainable, energy, it is about curing the incurable diseases, and preparing our infrastructure and cities for the next 100 years."

Economic friction is evident from the loss of middle-income repetitive tasks which may be largely automated or can use online tools for completion. Bank tellers, store check-out clerks and even K-16 teachers will be eliminated from the workforce in favor of ATMs, self-check-out kiosks and MOOCs. This is not only due to IoS but the integration of computation with our daily lives, as predicted by Herbert Simon and Mark Weiser.

IoS connectivity with a greater cross-section of objects and processes in addition to exposure to greater degree of monitoring (for example, in healthcare) will induce changes in behavior with increasing diffusion of the internet of things. Whether ubiquitous connectivity modifies rational versus irrational activity remains to be observed and analyzed (*Thinking Fast and Slow* by Daniel Kahneman). The outcome of such analyses must be taken into account when designing future products and services, for example, the wireless hospital of the future or MRI machines in hydrogen refueling stops or portable x-rays in medical huts in the Amazon. The utility of these advances may depend on the socio-economic ethos of the society (*Scarcity* by Sendhil Mullainathan) and its stage in socio-economic development (*Development as Freedom* by Amartya Sen).

The prediction that connectivity will change behavior is rooted in the fundamental principles of particle physics. The observer effect, as it is called, refers to changes that the act of observation will have on a phenomenon being observed (not to be confused with the uncertainty principle proposed by Werner Heisenberg). The former may explain why one can sing in the shower but not in public.

It may be noted that combined behavior, especially, time-centricity of cyberphysical systems (hardware and software integrated with physical objects) changes, if any one of the components are changed, even if the components are almost near-identical. The tryst with time may be difficult at times.

In addition to slow changes in behavior, economic re-equilibration will be sluggish because massive changes in our education system are necessary to optimize social consumption of the fruits of technology. No amount of technology or online courses will deter the spread of the rupture in our financial fabric unless we retrofit public education, re-install respect for academia, re-focus on rigor, rejuvenate all aspects of scientific research, restore the dignity due to a teacher and re-ignite the passion expected from a teacher.

The emerging supply chain of talent must include an abundance of girls who excel in math, who can code and write cohesively. It is essential that women pursue higher level of science, engineering, mathematics, economics and philosophy. How can we accept that about 50% of the brain power is left out of the workforce?

Educated women will help educate boys who are respectful and girls who are dignified. Taken together, they will accelerate the massively parallel innovation from distant crevices of the world. The latter is already ushering tectonic shifts even in the most traditional businesses. The analysis-paralysis approach of the behemoths may lead to their extinction if they continue to remain oblivious of the fact that failure is the new road to success, failure is the new key to success and failure is the mantra for those who wish to succeed.

Distributed innovation demands an entrepreneurial approach and an assault on multiple levels, concurrently, rather than the mythical silver bullet solution

(*Innovation: The Attacker's Advantage* by Richard Foster). The taxi cab industry vs uber, the hospitality industry vs airbnb and temp agencies vs oDesk are bright examples. Explosion of engineering tools has dramatically reduced the cycle time necessary to introduce innovation by vastly compressing the time from conception (development supply chain) to realization (fulfillment supply chain). Industry giants must harness this explosion by giving away platforms in order to aggregate the intelligence that can run on open source platforms. The flow of micro-revenue from billions of pings on your product will be the differentiator and that value-added data-service will be related to intelligent analytics of data and delivery of actionable information to the point of use ***before*** the data perishes.

However, the dynamics of perishability of data changes when the accumulation of time series data is far more critical for predictive analytics (for example, healthcare) rather than data with short half-life (for example, mean time between failure (MTBF) metric for spare parts). Data transport and data storage are important in this business but consumers may be willing to pay only for real-time analytics. Consumers expect raw data to be free.

However, all advantages are temporary. The financial wisdom from micro-revenue earnings from leasing the platform is one reason why Apple opened up its "bus" for anyone to hop on (create applications). Apps pour in from all over the world. The app creator is a part of the economic avalanche by allowing Apple, as the channel master, to aggregate micro-payments using open innovation. *Small data* from millions is the reason why Apple is laughing all the way to the bank with the world's largest database of payments, to the tune of 99 cents at a time. PayPal's success fueled Tesla which may give away the car to sell swappable graphene based batteries and on-board services using software defined networking (SDN). The automobile may be the mobile electricity grid of the future substituting for the smart immobile grid for off-grid distribution of power. Free products with pay-per-use micro-revenue based services is indeed a proven business strategy (printers vs ink, mobile phones vs services, water coolers vs bottled water) to amplify micro-earnings, which will enjoy a long life and substantiate the value of long tails.

The spread of IoT and IoS is expected to give rise to new (Datta, 2015b) products and services. The consumption of such goods and improvements in efficiency may generate a magnitude of economic growth which is inducing CEOs to be euphoric. According to GE, Cisco and others, the IoT and the industrial internet (IIoT) may add about $14 trillion to $19 trillion to the global economy, over the next decade. An explosion of consumerism is necessary for such numbers to materialize. The billions who are writing on the wall or posting photographs to buoy the software market cap of the social media bubble are in an earnings group which cannot afford the talking car or the avatar to manage the morning bed-tea or robotic laparoscopy. The educated consumer is the best customer. The bubble of the twitter frenzied social media economy may be limited by the amount of "energy under the curve" and the irrational exuberance may fuel the next global recession which may be just around the corner (2020-2022). With 2008 as the year of the last recession, we expect the next one around 2022 if the "boom-bust cycle" has a 14 year periodicity according to Finn Kydland (Nobel Prize in Economics, 2004).

In the US, several initiatives throughout industry and academia are emerging to address the next generation of advances in the IoT space, industrial internet, internet of systems (IoS) and the exciting possibilities from research in cyber-physical systems (CPS). Several consortia were formed in 2014-2015 with backing from market-leading companies. Several academic groups are leading the way with new inventions and innovation. The EU has funded a massive multi-year program called Horizon 2020 to the tune of more than $100 billion to explore the growth of IoT and help harvest the associated economic windfall.

But, it will be an egregious error on the part of the global leadership to be blinded by the economic projections and continue to polish the chrome without paying attention to tune the engine of education. Is a smart city (Datta, 2015a) really smart without smart citizens?

Humanity needs dreamers (Datta, n.d.) and education (Datta, 2014) is the quintessential salt (*Salt* by Mark Kurlansky) which acts as the purveyor of inspiration, imagination, invention, innovation and drives implementation of ideas (Datta, 2015b). The education of a boy may change the fate of a man. The education of a girl may change the destiny of a nation.

References

Ashton, K. (2009). In the real world, things matter more than ideas. *RFID Journal*. Accessed September 2015.

http://www.rfidjournal.com/articles/pdf?4986

Datta, S. (2014). *Far Reaching Changes in the Near Future* [e-book]. Accessed September 2015.

http://bit.ly/Book-by-S-Datta

Datta, S. (2014). *Internet of Systems (IoS) - Economic Re-equilibration Catalyzed by Internet of Things (IoT)*. Accessed September 2015.

http://bit.ly/MIT-IOT

Datta, S. (2015a). *Smart Cities* [presentation]. Accessed September 2015. Retrieved from:

http://bit.ly/SMART-CT

Datta, S. (2015b). *Presentation of Datta 2015* [presentation]. Accessed September 2015.

http://bit.ly/RE-VIEW-IOT

Datta, S. (n.d.). *Humanity Needs Dreamers* [presentation]. Accessed September 2015.

http://bit.ly/HND-250

HITACHI. (2015). Quantum Measurement. Accessed September 2015.

http://www.hitachi.com/rd/portal/highlight/quantum/index.html#anc04

Manyika,J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C.,& Hung Byers, A.(2011). Big data: The next frontier for innovation, competition, and productivity. *McKinsey Global Institute*. Accessed September 2015.

http://tinyurl.com/Industrial-Internet

Sarma, S., Brock, DL., & Ashton,K. (2000). The Networked Physical World. *MIT AUTO-ID CENTER*. Accessed September 2015.

http://tinyurl.com/Industrial-Internet

The MIT Sloan CIO Symposium. [MIT Sloan CIO Symposium Videos]. (2013, August, 29). *2010-09 The Internet of Things* [Video file]. Accessed September 2015.

https://www.youtube.com/watch?v=44MLERLwxig

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Leveraging smart specialisation strategies (RIS3) with service-based innovation: the case of the Canary Islands

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Policy Letter

Service based economies face significant challenges to drive innovation. These are even larger for distant and isolated regions, suffering from different market failures due to such circumstances. Capitalizing on smart specialization alongside with the transformative power of services, through the deployment of large-scale demonstrators, could be a sound policy option for many regions to turn structural weaknesses and threats into strengths and opportunities. The specific case of the Canary Islands, an outermost European region, is discussed in the context of its RIS3 Smart Specialisation Strategy.

Keywords. Outermost Region, Tourist Region, EU Regional Policy, Structural Funds, Service, Innovation.

1 Introduction

The Canary Islands is one of the Outermost Regions (ORs) of the European Union (EU). Such regions are specifically addressed by the EU Treaties in order to deal with particular drawbacks due to remoteness, small size, territorial fragmentation, difficult topography and consequent economic limitations. The Canary Islands was incorporated to the Crown of Castille by the end of the XV Century, as Spain was developing as a modern state. Nowadays, with a local population of 2.1 million inhabitants, it is one of the main touristic destinations in the World, hosting more than twelve million visitors every year. Nevertheless this booming touristic development, carried out mainly since the late 1960s, has come with a cost: the whole economy spins around a basic sea-and-beach tourism model, with a lack of complementary high added-value activities, and an extremely low presence of industry and knowledge intensive services. Moreover, tourism and construction turned out to be a powerful feedback loop, not always driven by quality and natural environment preservation, but by a mindset focused on the quest for an easy and fast return on investment. Hence, the economy grew not wealthy, but featuring many shared attributes with other regional economies also doomed by the well-known "curse of resources". In the case of the Canary Islands such resources are a gorgeous nature and weather, with land never far from the beach and the countryside. With this setting, the impact of the financial crisis in terms of unemployment and destruction of economic activity and opportunities has been, simply, huge.

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On the other hand, the European Union has been actively promoting the development of a knowledge-based economy with the capacity to overcome the gap in economic competitiveness, productivity and innovation with the USA, at least since 2000 with the Lisbon Strategy. In 2010 the previous Lisbon Strategy was replaced by the current (Europe 2020) strategy, with an overall similar goal but with a somehow different approach. By recognizing the fundamental role of European regions in order to fulfil the ambitious challenges of (Europe 2020), the revised European Cohesion Policy has introduced Research & Innovation Smart Specialisation Strategies (RIS3) as a key element to foster knowledge-based regional development across the EU (Foray 2013).

RIS3 strategies should provide excellent opportunities to base regional economic growth on solid and wealthy roots, by taking into consideration the specific situation of every European region and aiming achievable yet ambitious economic goals for the mid- and long-terms. European structural funds will leverage public and private investments towards this end. Obviously, the role of service innovation in promoting knowledge-based economic competitiveness and productivity is paramount. And it is the only feasible way to proceed for regions, such as the Canary Islands, which lack a strong industry sector and whose economies are currently based on non-sophisticated services. Even more so for ORs, whose structural constraints weaken any attempt to develop a traditional industry sector.

In this paper a critical discussion is presented on RIS3, as a practical policy tool to promote regional economic transformation based on knowledge and service innovation. The case study will be the Canary Islands, whose specific features can also be of interest not only to other ORs, but to isolated and small regions in search of policy models to boost their economic growth. First an introduction to the concept of research and innovation smart specialisation strategy (RIS3) is presented. Then the main economic, social and geographic features of outermost regions and, in particular, of the Canary Islands are introduced. Third, the RIS3 of the Canary Islands (RIS3 Canarias 2014) and the role of service innovation in it are described, as theoretically intended by the policy makers following the recommendations from the European Commission services. Then some practicalities are discussed, focusing the spotlight on those usually unaccounted facts (mainly sociological and political) that quite often make sound policies fail. Finally some conclusions are provided. Formal evidence is mainly drawn from statistical authorities, and authoritative academics and policymakers, either individuals or organizations, and properly cited. Yet some of the practicalities come from my own implementation experience as the coordinator of the RIS3 elaboration process in the Canary Islands and, as such, they are endowed with a more subjective, though fully motivated, content.

2 What's a RIS3 Strategy?

RIS3 strategies have been conceived (Foray et al. 2012, Foray et al. 2013) as location-based holistic socioeconomic transformation agendas at the hard-core of (Europe 2020). To this extent they address the key regional priorities, as related to knowledge economy, taking into consideration evidence-based real regional potential for global competitiveness based on innovation and local capacities. Both technological and practice-based innovations are promoted, and every relevant stakeholder is to be fully involved. New economic activities should only be promoted by public policies as they stem from the socioeconomic regional reality and taking into consideration their transformative power. Hence a so-called entrepreneurial process of discovery is fostered, so that the full energy of unknown entrepreneurs can be fully leveraged beyond the most acquainted players. As with any sound public policy, monitoring and evaluation schemes must be put into place in order to assess overall policy outcome

and specific outputs and, consequently, to enhance the policy deployment.

Even though RIS3 strategies are to make an important impact on the three (Europe 2020) priorities, i.e. smart, sustainable and inclusive growth, they were first conceived as an instrument for smart growth. Nevertheless their use in achieving sustainable (Landabaso 2012) and inclusive (Huysentruyt et al. 2013) growth has been encouraged. Moreover, in order to promote RIS3 strategies across the EU, they are considered an ex-ante conditionality for EU member states and regions to access to part of the EU Cohesion Policy structural funds. It must be stressed that RIS3 strategies go much beyond Cohesion Policy: they are truly integrated cross-sectoral transformation agendas. Structural funds simply provide an incentive to leverage additional public and private investment and to aim the overall targets of (Europe 2020) at the regional level as prescribed by the RIS3 strategies.

In order to fulfill the ambitious goals of RIS3s (Foray et al. 2012) proposed a six-step approach to develop them, which has been followed by regions across Europe:

1. Analysis of the regional context and potential for innovation,
2. Set up of a sound and inclusive governance structure,
3. Production of a shared vision about the future of the region,
4. Selection of a limited number of priorities for regional development,
5. Establishment of suitable policy mixes,
6. Integration of monitoring and evaluation mechanisms.

3 The Canary Islands: A European Outermost Region

Past experience has clearly shown that *one-size-fits-all* approaches to regional innovation policies are doomed to failure. This comes as no surprise, since identifying and exploiting competitive advantage has mainly to do with taking advantage of the unique strengths and opportunities that every region has, while overcoming its specific weaknesses and threats. Hence, the first step in the development of a RIS3 is to carry out a thorough regional analysis, with a broad participation of stakeholders.

3.1 European Outermost Regions (ORs)

According to Art. 349 of the Treaty on the Functioning of the EU (TFEU):

> *Taking account of the structural social and economic situation of Guadeloupe, French Guiana, Martinique, Réunion, Saint-Barthélemy, Saint-Martin, the Azores, Madeira and the Canary Islands, which is compounded by their remoteness, insularity, small size, difficult topography and climate, economic dependence on a few products, the permanence and combination of which severely restrain their development, the Council, on a proposal from the Commission and after consulting the European Parliament, shall adopt specific measures aimed, in particular, at laying down the conditions of application of the Treaties to those regions, including common policies.*
>
> *Where the specific measures in question are adopted by the Council in accordance with a special legislative procedure, it shall also act on a proposal from the Commission and after consulting the European Parliament.*
>
> *The measures referred to in the first paragraph concern in particular areas such as customs and trade policies, fiscal policy, free zones, agriculture and fisheries policies, conditions for supply of raw materials and essential consumer goods, State aids and conditions of access to structural funds and to*

> *horizontal Union programmes. The Council shall adopt the measures referred to in the first paragraph taking into account the special characteristics and constraints of the outermost regions without undermining the integrity and the coherence of the Union legal order, including the internal market and common policies.*

Even though according to European Law some policies are modulated for ORs, it must be stressed that ORs are fully integrated in the EU and in its borderless single market. In fact, the EU policy towards ORs has evolved, over the years, from a purely compensating scheme to another one where, in addition to overcoming structural difficulties, their unique assets are identified and leveraged (EC DG Regio, 2010). Since the early 90's the EU developed specific support programmes for the ORs, and since 2004 the EU had an integrated strategy for ORs based on active partnerships between EU institutions, member states (MS) governments and ORs in order to fulfil three priorities: making the ORs more accessible, more competitive and more integrated with the countries around them. This strategy has been renewed with the view that ORs are not only fragile regions facing severe drawbacks, but also important assets for the EU as a whole and for the surrounding countries. The 2008 Commission policy paper "The outermost regions – an asset for Europe" elaborates on this idea in order to exploit the unique regional assets to boost economic development, with particular focus on sectors with high added-value, such as the agri-food industry, biodiversity, renewable energy, astrophysics, aerospace, oceanography, volcanology, seismology, and to promote the regions' role as outposts of the EU in the world (EC COM 642, 2008, EC COM 507, 2007). A notorious clue of the new approach to leveraging the unique assets of ORs is the special issue of the Research*EU Focus magazine (Research*EU Focus 2010). For example, ORs have the largest share of terrestrial and marine biodiversity in the EU, active volcanism and geothermal energy is present in several territories, the European Space Agency has a launching centre in French Guiana and the Canary Islands host the main astronomical observatories on European soil.

Former European Commissioner and Spanish Minister of Agriculture, Economy and Finance, Mr. Pedro Solbes was commissioned by the European Commission in 2011 to develop a report with a thorough analysis and a set of proposals for ORs (Solbes-Mira, P., 2011). The weakness of the ORs' economies is made evident by main indicators performing much worse than EU average, with much higher rates of unemployment and much lower GDP per capita. In fact, it is their lack of integration, both with the EU mainland and with their surrounding territories, what hampers mobility and competition and results in several market failures. Since this is the outcome of structural limitations, mainly due to geography, some of the acceptable measures to overcome them could be permanent, such as for example, some state aids for the mobility of persons and goods, including information and energy. Mr Solbes recommends active policies to strengthen integration within the single market as well as with their regional environment, and to fully implement Europe 2020.

As a short summary of the socio-economic situation currently faced by ORs (as of 2012 for sake of comparison, 2013 for unemployment, data from EUROSTAT), some figures are presented in the next table, where percentages for each OR population and GDP are taken with respect to their respective Member States (MS) and such percentages for each MS are taken with respect to EU-27.

Table 1. Socio-economic situation currently faced by ORs

	Population	Density	GDP	Unemployment	R&D/GDP
EU 27		116,92		10,40%	2,12%
Spain	9,2%	92	8,5%	25,00%	1,34%
Canary Islands	4,6%	283	3,9%	33,7%	0,60%
Portugal	2,1%	114,5	1,4%	15,70%	1,50%
Madeira	2,5%	333,7	3,0%	18,10%	0,25%
Azores	2,3%	106,3	2,1%	17,00%	0,40%
France	13,0%	103	15,8%	10,30%	2,34%
Guadeloupe	0,7%	264,5	0,4%	26,20%	N/A
Guiana	0,4%	2,8	0,2%	21,30%	N/A
Martinique	0,6%	347	0,4%	22,80%	N/A
Rèunion	1,3%	333	0,8%	28,90%	N/A

3.2 The Canary Islands

Even though ORs share very significant features, they are also very different from each other. As for the Canary Islands, it has evolved over the last decades as one of the main tourism destinations in the World. The (IMPACTUR 2013) report on the economic impact of tourism in the Canary Islands show the following findings:

- Number of visitors: 12.1 million (10.6M international + 1.5M mainland Spain). As a reference, current resident population is 2.1M. After a minimum in 2009, the current number of visitors is above the pre-crisis level.
- Contribution to total GDP: 31.2% (20.8% direct + 10.4% indirect). Its evolution was 29.5% (2008), 27.1% (2009), 28.1% (2010), 29.5% (2011), 29.7% (2012). As a reference, contribution for Spain is 10.9% (2013).
- Contribution to total employment: 35.2% (24.8% direct + 10.4% indirect). Its evolution was 33.9% (2008), 31.7% (2009), 32.7% (2010), 34.0% (2011), 34.4% (2012). As a reference, contribution for Spain is 11.9% (2013).

These figures clearly show an enormous economic bias towards tourism, which pulls from the whole economy and contributes to *some* recovery from the financial crisis. Nevertheless it must be noticed the low labour productivity of tourism and the high overall unemployment, which remains huge at 32,4% (2014). The story is simple: tourism developed in the Canary Islands mainly as a low value-added activity, entangled with a surge in construction to make it possible. Receiving millions of visitors boasting a wonderful weather and nature is not very difficult, even more when commercialisation, transportation, investment and most products offered to the tourists come from somewhere else. A bubble of wealth disguised what actually was a clear case of "curse of resources", produced not by oil but by a nice weather and environment. Industry or trade have not had any chance to develop, other than focusing on the local opportunities provided by tourism and construction, while protected by distance, fragmentation and some custom and fiscal provisions. Even more dramatic, unemployment has grown more during the crisis among scientists and technologists than for the average population (RIS3 Canarias 2014). This is an aggravated version of the overall Spanish scenario, which holds a more diversified economy but also many difficulties to allocate high added value activities carried out by qualified workers.

Even though one might consider the previously mentioned situation as very negative, there are also real opportunities and strengths: a reasonable education system, including two large universities, which goes along with competitive research centres; a good health system; good infrastructures and civil facilities, including a network of airports, seaports, and telecommunications, with several international submarine

telecommunication cables connecting with Europe, Africa and America,… And, of course, loads of visitors willing to tour the Islands every year, as well as world-class resorts, nice weather, beautiful environment and closeness to developing Africa.

4 RIS3 and Service Innovation: the case of the Canary Islands

Once a down-to-earth assessment of the current situation, as well as of potential for change, is done (step 1), a social discussion has to be carried out. A transformation agenda has to be embraced by the society itself, not only by policy makers. Hence a governance structure promoting both informal and formal participation with stakeholders and the general public has to be set up (step 2). It is of paramount importance not to lose the momentum provided by dynamic (and young) entrepreneurs, so the governance system has to address an entrepreneurial process of discovery that brings to surface those unknown talented people and SMEs. A realistic vision has to be shared for the long-term, so that the society not only dreams it to come true but also strives for it (step 3). This step is not to be underestimated, as it is essential to nurture the required social mindset. In the RIS3 of the Canary Islands the vision can be simply summarized as the result of taking advantage of knowledge in the economy (so that young educated people have job opportunities), innovating the tourism to make it genuine, with competiveness based on quality and difference, and leveraging the Canary Islands as a transatlantic trade and cooperation hub.

Then a few priorities are to be agreed and public policies are to be designed to pursue them. The regional economy should be steered towards such priorities, identified as global niches for competitiveness (step 4). The selection is always tough, since influential groups are not to be allowed to bias them in their own interest. A toolbox of policy instruments is then designed to render a comprehensive policy mix (step 5). For the Canary Islands the policy mix was largely inspired by drafts from (Saublens, 2013), as SMEs and entrepreneurs play a crucial role in the whole setting. Finally, output monitoring and outcome evaluation instruments are proposed to assist the whole governance system (not only the policy makers) to assess the RIS3 and update it whenever necessary (step 6).

For the sake of brevity, only the priorities of the (Canary Islands RIS3 2013) are depicted next, and discussed as related to service innovation. The transformative power of service innovation has been identified as a key driver to revamp the whole economy, by upgrading and innovating traditional economic sectors and industries into more productive, competitive and higher value-added business eco-systems (EU Expert Panel on Service Innovation, 2011). In order to capitalise such power, large-scale demonstrators were recommended, if possible at market level with a cross-sectoral conception instead of small prototypes, as a means to test policies to deal with modern societal challenges. The European Service Innovation Centre (ESIC) was commissioned by the European Commission to provide expert advice to six European regions on this matter, being one of them the Canary Islands (ESIC-Canary Islands, 2013). As acknowledged by ESIC:

> *"Canary Islands represent the best laboratory to effectively test the transformative power of service innovation to tackle societal challenges and to then replicate this approach in regions with similar conditions".*

The concepts of smart specialisation and of the transformative power of services turned out to be highly synergic and, in fact, the large-scale demonstrator approach should be fertile soil to capitalize on both.

4.1 The Canary Islands RIS3 Priorities

From the previous analysis, alongside with discussion with many stakeholders, five priorities were selected:

Smart tourism leadership: tourism is deeply rooted in solid grounds in the Canary Islands. The challenge is to turn it into a higher-added value sector, providing not only better jobs but also cross-sectoral synergies. This priority is composed of two utterly indissoluble components:

1. Enhance the competitiveness of the tourism sector through innovation: the destination must be genuine, providing experiences beyond conventional "sea, sun and sand". This includes natural, cultural sporting, wellness and gastronomic experiences. For example, nature is a huge asset, with many opportunities for trekking, bird watching, star gazing, diving and, of course, sea bathing. In cultural terms, the Canaries are midway America and mainland Spain with its own history, folk and artistic features. Wines from regional grape varieties, cheeses and produce from local distinctive agriculture and livestock provide a different taste experience. Innovation should also encompass market and organizational activities, with ICTs being an extraordinary means to manage the experience both with the visitor at destination and at home. Green labels will be a hefty distinction for attracting visitors respectful with the environment, which demand for sustainable energy, water and waste management.
2. Capitalise on tourism for economic diversification: hosting a visiting population over twelve million tourists every year, satisfying them with the experiences they expect and (positively) surprising them with the experiences they don't, is by no means an easy task. There is a huge array of business opportunities in this specific niche, in so diverse areas such as ICTs, sustainable technologies (energy, water, waste, construction,…), logistic, gastronomy, leisure, marketing or organizational consulting to name a few. Knowledge of tourist preferences and closeness to the activities are relevant assets, not only to provide many of the services from the Canary Islands but also to export them to other tourism destinations worldwide. It's a door wide open to diversification from the sector itself, which has not been much transited by regional businesses.

Smart Atlantic hub: capitalise on the geostrategic location of the Canary Islands by its promotion as an international trade, logistic and business hub for its regional area. This includes a huge array of opportunities considering the nearness of developing Western Africa, and the close relationship with Europe and America. For example, the industrial adaptation and deployment of renewable energy and water management technologies for Africa, as well as Kyoto-inspired clean development mechanisms, or cooperation for development programs could be reinforced by locating activities in the Canary Islands.

Socioeconomic Valorisation of R&D: this is to be accomplished in two ways. On the one hand, by the concentration of efforts on specialised areas, such as astronomy, marine sciences and biodiversity. On the other hand, by the promotion of activities devised to deal with the specific challenges of the other priorities.

The third and fourth priorities are the development of the **information society** and of **environmental sustainability**. While both are cross-sectoral priorities over the whole EU, they have specific traits in the Canary Islands. For example, distance and fragmentation is cause for some market failures both in ICTs and energy. For example, wind and sun bounty must supply energy to electrically isolated islands. This is a technical challenge shared not only by islands worldwide, but also by continental areas with weak or sparse electrical grids.

5 Some practicalities (or lessons learnt the hard way)

Boosting an economic transformation agenda requires active policies that leverage public and private efforts. In the current financial situation of the Canary Islands, ORs and other EU regions, it is difficult to expect any public funding other than that arising from the EU Cohesion Policy Structural Funds. Some remarks must be made:

- According to the Treaties, EU policies must conform to the so-called principles of subsidiarity and proportionality for the sake of decentralized multilevel government. This means that policies must be implemented as much as possible by member states and regions, instead of by the European Commission. At the same time Structural Funds must be managed by member states according to the principle of additionality, by which EU funding must be additional to structural national and regional funding. In other words, member states and regions are not supposed to use EU funding to carry out public policies that they would anyway deploy. Moreover structural funds are reimbursed by the EU once the activities have been carried out. Hence they are not given in advance. Tight budgets and the current harsh limitations for public debt make it very difficult to allocate financial resources to fulfil the principle of additionality while promoting truly innovative policies with the momentum to leverage societal transformations. This has proved a significant drawback for Structural Funds during the EU period 2007-2013, which will remain for 2014-2020 unless it is properly addressed.
- The management of EU Structural Funds is cumbersome, to say the least. While their legitimate use must be assured, the administrative burden should be kept as low as possible for the sake of overall efficiency. The resulting bureaucracy not only overloads administrative services, but also SMEs with excessive red-tape.
- The integration of the short-time urges faced by Governments with academically-oriented strategies, in the presence of harsh financial situation, alongside the principles of subsidiarity and additionality and the administrative complexity to manage the funds is a daunting task. Even more if one considers that regions in need of structural funds usually have less efficient organisations and a social mindset worse tuned to the needs of the knowledge economy. Hence the kind of innovation that is needed first is the most difficult to achieve, organisational innovation, which in the public sector requires the leadership of innovative politicians with broad social support. Such a challenge!

6 Conclusions

This paper discusses the suitability of using smart specialisation and the transformative power of service innovation to boost knowledge-based economies. Attention is paid to EU ORs and, in particular, to the Canary Islands, but possibly the main ideas can be extrapolated to some other regions. Tourism is the main driver for cross-sectoral service innovation, the challenge being to evolve from a conventional sun, sea and sand tourism model with low productivity, to a genuine high value-added one, capitalising on every knowledge-based possibility and not only on natural factors. This approach should deliver opportunities for diversification stemming from the tourism sector itself. Nevertheless, properly addressing societal and political issues is much more complicated than designing sound policy strategies. Some remarks are also given on these facts.

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7 References

Ciaian, P., Kanks, D., Brandsma, A. (2013), The Role of Additionality in the EU Cohesion Policies. Scientific and Technical Report JRC81893. Accessed May 2015.

https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/role-additionality-eu-cohesion-policies?search

EC DG Regio (2010), The Outermost Regions: European Regions of Assets and Opportunities. Accessed May 2015.

http://ec.europa.eu/regional_policy/en/information/publications/brochures/2010/the-outermost-regions-european-regions-of-assets-and-opportunities_0

EC COM 642 (2008), The outermost regions: an asset for Europe. Communication from the European Commission COM/2008/0642 final. Accessed May 2015. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0642:EN:HTML

EC 507 COM(2007), Strategy for the Outermost Regions: Achievements and Future Prospects. Communication from the European Commission COM/2007/507 final. Accessed May 2015.

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0507:FIN:EN:PDF

ESIC-Canary Islands (2013). European Service Innovation Centre. Accessed May 2015.

http://ec.europa.eu/growth/tools-databases/esic/large-scale-demonstrator/canary/index_en.htm

EU Expert Group on Cultural and Creative Industries (2012). How can cultural and creative industries contribute to economic transformation through smart specialisation? European Union Open Method of Coordination. Accessed May 2015.

http://s3platform.jrc.ec.europa.eu/documents/10157/0/120420%20CCI%20Policy%20Handbook%20(FINAL).pdf

EU Expert Panel on Service Innovation (2011). The Transformative Power of Service Innovation. DG Industry & Enterprise, European Commission. Accessed May 2015.

http://ec.europa.eu/enterprise/initiatives/esic/materials/expert_panel_report.pdf

EU Regulation 1303 (2013). Provisions on the EU Structural and Investment Funds. Accessed May 2015.

http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32013R1303&from=ES

Europa 2020. Accessed May 2015. http://ec.europa.eu/europe2020/index_en.htm

Foray, D., Goddard, J., Goenaga-Beldarrain, X., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., Ortega-Argilés, R. (2012), Guide to Research and Innovation Strategies for Smart Specialisation (RIS 3). European Commission. Accessed May 2015.

http://s3platform.jrc.ec.europa.eu/documents/10157/267027/RIS3%20Guide.pdf

Foray, D., Goenaga- Beldarrain, X. (2013). The goals of smart specialisation. S3 Policy Brief Series No. 01/2013, EUR – Scientific and Technical Report JRC Nº JRC82213. Accessed May 2015.

https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/goals-smart-specialisation-s3-policy-brief-series-no-012013?search

Huysentruyt, M., Bulakowskiy, M., Ramsden, P. (2013), Guide to Social Innovation. DG Regional & Urban Policy, European Commission. Accessed May 2015. http://s3platform.jrc.ec.europa.eu/documents/10157/47822/Guide%20to%20Social%20Innovation.pdf

IMPACTUR (2013), Estudio del Impacto Económico del Turismo sobre la Economíia y el Empleo en las Islas Canarias. Exceltur. Accessed May 2015.

http://exceltur.org/wp-content/uploads/2014/11/Estudio-IMPACTUR-Canarias-2013.pdf

Landabaso, M. (2012), Connecting Smart and Sustainable Growth through Smart Specialisation. DG Regional & Urban Policy, European Commission. Accessed May 2015.

http://s3platform.jrc.ec.europa.eu/documents/10157/0/greengrowth.pdf

Research*EU Focus (2010), European research area: boosting the potential of the outermost regions. European Commission. Accessed May 2015.

ftp://ftp.cordis.europa.eu/pub/news/research-eu/docs/research-focus-05_en.pdf

RIS3 Canarias (2014), Estrategia de Especialización Inteligente de Canarias (2013). Gobierno de Canarias. Accessed May 2015.

http://www3.gobiernodecanarias.org/aciisi/ris3/

Saublens, C. (2013), Regional Policy for Smart Growth of SMEs, European Commission. Accessed May 2015.

http://s3platform.jrc.ec.europa.eu/guides

Solbes-Mira, P. (2011), Europe's Outermost Regions and the Single Market: The EU's influence in the world. European Commission. Accessed May 2015.

http://ec.europa.eu/internal_market/outermost_regions/index_en.htm

Unit D.5- Clusters and Support for SMEs (2012), The Smart Guide to Service Innovation. DG Enterprise & Industry, European Commission. Accessed May 2015.

http://s3platform.jrc.ec.europa.eu/documents/10157/0/Smart%20Guide%20to%20Service%20Innovation.pdf

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Exploring the cultural basis of innovation

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Abstract. The paper explores the relationship between leadership, culture and innovation. Through an analysis of four enterprises, voted by their peers as having strong innovation-friendly cultures, we explicate the assumptions embedded in these innovation-supporting cultures, and outline the leadership practices that have created them. By locating the study within the interpretivist research paradigm and adopting the 'practice turn' perspective that has characterised recent leadership research, this study has been able to acknowledge and address the political dynamics involved in the creation of innovation-conducive cultures.

Keywords. Organizational Culture, Leadership, Innovation, Practice Theory.

1 Introduction

Innovation has become the pre-eminent requirement for competitive advantage-and thus survival-within the current challenging and dynamic global economy. Innovation, however, is very difficult to achieve in practice and thus in many organisations its rhetorical expression is the only form that it takes. Given that, by definition, innovation is disruptive of the *status quo*, it is not surprising that those who have vested interests in the *status quo* will be ambivalent about it, at best, and resistant to it, at worst. As Verhoeff (2011) points out, in spite of considerable documented knowledge on the capabilities required for innovation, the innovation record of large publically-owned companies, in particular, is not impressive. This point is supported by Henderson (2006) and Henderson and Kaplan (2005); as well as Jaruzelski et al. (2011) who surveyed a large sample of publically-owned companies and found that their 'tolerance for failure' was low. This, they argue, raises serious questions about these companies' appetite for risk taking.

This situation has significant implications for the leadership of large organizations in that it suggests that structural and cultural factors may undermine the execution of the strategic intent to innovate. Given the need for transformational action that fully embraces risk, innovation requires a social environment in which key stakeholders are open to the challenge of transformational learning, however demanding and intimidating they may view this challenge. The creation of such an environment, as Schein (1988) points out, requires the critical scrutiny of the appropriateness of the prevailing organizational form and the cultural assumptions that it has spawned. Similarly, to convert innovation talk (rhetoric) into innovation action (execution), the raft of structurally-embedded, innovation-killing, business-as-usual practices [such as those embedded in risk and performance management systems and justified by the taken-for-granted *enterprise logic* (see Zuboff and Maxmin, 2002)] must be reviewed. Furthermore, the cultural assumptions embodied in the everyday routines to which stakeholders have become inured, must be addressed (Dovey and McCabe, 2014). Gottlieb and Wilmott (2014) concur that unless attempts at innovation are supported by appropriate structurally-embedded practices and cultural assumptions, they are likely to be resisted effectively in spite of any rhetoric to the contrary. In this respect, the symbiotic relationship between structure and culture is recognised as a

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phenomenon that can exert significant influence upon the innovation process.

This paper attempts to address the issue of the cultural antecedents of innovation by analysing the cultural basis of the innovation capabilities of four organisations recently voted as having the most innovation-supporting culture by 244 members of the Australian Information Industry Association (AIIA), through a University of Technology Sydney (UTS) designed survey. From an analysis of the survey data, leadership presentations at the award ceremony and follow-up interviews, an attempt is made to explicate, and discuss, the cultural environment that differentiates these companies from their competitors. Furthermore, the leadership practices that have created these innovation-supporting cultural environments are explored with the view to explaining how each of these companies has created an organisational form and culture that is flexible enough to adapt its particular innovative ambitions to its constantly changing operational circumstances.

2 Leadership, Culture and Innovation

Although the phenomenon of organisational culture has been widely researched [see Büschgens et al., (2013) for an overview of this research], there exists little consensus on its nature. For example, the literature review conducted by Kroeber and Kluckhohn in 1952, found 164 definitions of culture. From our perspective, a contributing factor to this confusion is the fact that the vast body of research on this phenomenon is located within the positivist research paradigm: a paradigm that features realist ontological, and objectivist epistemological, assumptions and that seeks acontextual and apolitical, or value-neutral, knowledge of this phenomenon. This search for 'objective' knowledge of a socially constructed concept such as 'culture' seems, to us, to have led to its obfuscation.

The relatively recent 'practice turn' in strategy, leadership and organizational research (see Crevani et al., 2010; Carroll et al., 2008; Whittington, 2006), has challenged the ontological, epistemological and, thus, methodological assumptions of the positivist research paradigm. Located within the constructionist research paradigm (which features nominalist ontological, and inter-subjectivist epistemological, assumptions), the 'practice turn' perspective views leadership for innovation as a collective inter-subjective achievement. This achievement, it argues, encompasses deeply political processes in which multiple stakeholders are involved in collectively-reflexive practices that co-create, and continuously re-create, an innovation-conducive set of social practices or culture. This approach reflects a more dynamic notion of culture; one which is less prone to reification because of the continuous critical scrutiny of cultural assumptions that is enacted through everyday reflexive practices as a collective negotiates emergent social and competitive contexts. The governance of such practices takes the form of a stakeholder covenant, or social contract, upon which there is broad strategic consensus. As Rouse (2007, p. 531) points out, such 'strategic intent' needs not be explicitly stated but is embedded in practices that feature patterns of interaction that 'constitute something at issue and at stake in their outcome'. Such a 'negotiated order' (an order which embraces intellectual contestation and critique) recognises the necessity for the constant critical scrutiny of power relationships, through collectively-reflexive practices, for valuable ideas to be realised in innovative new products, services and processes (see Allen, 2015; Dovey and White, 2005; White and Dovey, 2004). In his study of technical innovation within an iconic global high-tech organisation, Allen (2015) showed that social innovation preceded technical innovation in that technical innovation only manifested once the prevailing power relations had been transformed appropriately (on this point, also see Karlsen and Larrea, 2014; Verhoeff, 2011). Furthermore, Allen (2015) demonstrated

that such transformation requires the co-creation of collectively-reflexive practices that facilitate the kinds of critical inter-subjective engagement necessary for conventional thought, embedded assumptions (cultural and personal), and vested interests to be effectively challenged.

Schein's (1985, p.9) definition of culture is one that is compatible with our paradigmatic assumptions in that it recognises the social construction of the concept, and it indirectly signals its potential for reification. He defines culture as:

> *"a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems."*

From this perspective, culture is viewed as a tacitly acquired set of socially constructed assumptions that have become embedded in the everyday social practices of a group with a shared history. These assumptions act as a 'taken-for-granted' prescription (and rationale) for everyday behaviour and, in this respect, represent an unquestioned 'guide to action' (or inaction) in accordance with tacitly socialized knowledge bases that have developed over time in response to specific historic organisational problems and challenges. As a form of unquestioned 'recipe knowledge' (that is socialised not as 'this is an answer that our predecessors developed in relation to such-and-such a problem in the past' but rather, as Schein posits, as 'this is the only way to think, feel and act in relation to this problem') culture rarely informs explicit governance documents in organisations. It is usually through the 'unwritten ground rules' for organisational behaviour that culture finds expression.

Schein (1985) views leadership and organisational form (or structure) as the most important antecedents in the formation of culture. He views those with power (as a consequence of ownership and/or structural arrangements) as mediators of the interpretation of problems encountered by a group, and as influencers of how these problems are to be addressed collectively. Aided by forms of hegemony (see Williams, 1977), when culture is tacitly endorsed by leadership as an infallible set of 'recipe solutions' to problems, a habitual, uncritical, collective response to new problems is ensured (what Bourdieu,1977, refers to as *habitus*).

With reference to structural antecedents of cultural assumptions, Zuboff and Maxmin (2002) coin the phrase 'enterprise logic', which refers to the deep structure (or ideological underpinning) of practices within an organisation. These practices are underpinned by shared assumptions, values and attitudes that have become reified as a consequence of the hegemonic logic that has over time shaped structure, strategy and management processes into an effective whole (Miles et al., 1997, p. 7). As Dovey and Fenech (2007, p.574) explain:

> *"[T]his is a process in which structural arrangements are put into place (particularly with respect to principles and practices of power and resource management) and gradually become manifest in cultural norms (shared assumptions, or mental models, with respect to 'how the world works'). This ultimately leads to patterns of taken-for-granted behaviour that reflect the hegemony of this logic. Over time, a range of institutional, organisational and individual (socio-psychological) practices that sustain shared assumptions about the 'reality' of these ideological arrangements, become formalised."*

Schein (1988, p.15) emphasises the point that organisational structure and culture are mutually reinforcing and, thus, should not be thought of as two separate phenomena:

> *"the basic organization design in terms of who reports to whom and*

> *who is accountable for what are typically thought of as the major elements of the "formal" structure. But as in the case of organizational processes, these structures are ultimately a reflection of the underlying cultural assumptions. One of the common misconceptions in this area is that structure can be analysed as a factor separate from culture. If one starts with a socio-technical model of organizations, one cannot separate structure from culture. One can, however, ask whether some formal structures are more likely to facilitate or encourage learning, adaptation, and innovation, and, if so, what kinds of cultural assumptions will favor the evolution of such structures?"*

In recent times, many smaller 'insurgent' organisations have begun to successfully challenge the market dominance of large organisations (see Naim, 2013) and their success is due in large part to the adoption of a structural form that allows more appropriate assumptions about organisational life to manifest in the everyday behaviours that fuel innovation (see, for example, Fisher, 2005).

In summary, we view culture as an inter-subjective phenomenon that reflects human interests-especially those of the most powerful members of a 'cultural community'. As such, it is a political construct that manifests sub-consciously in "shared routines of behaviour, including traditions, norms and procedures for thinking, acting and using 'things'" (Whittington, 2006, p.619). Managing the cultural politics of innovation in response to emergent challenges within a dynamic business environment is thus an important leadership responsibility. The 'practice turn' in leadership studies views this responsibility as a collective one; as one which is addressed through practices that engage the collective intelligence in the appropriate transformation of assumptions in line with the shared commitment to innovate. In this respect, in a special article in the *Harvard Business Review* entitled 'Looking Ahead' (see Drucker et al., 1997, p.18), that articulated the view of five business 'visionaries' (Peter Drucker, Charles Handy, Esther Dyson, Paul Saffo and Peter Senge) with respect to the most important challenges likely to be faced by leaders of organizations in the 21st Century, the journal's editors summed up these five contributions by identifying one common theme:

> *"What is perhaps most interesting about their comments is how each thinker, in his or her own way, has identified challenges that are not so much technical or rational as they are cultural."*

The adoption of innovation as a competitive strategy thus requires the alignment of cultural assumptions with that strategy if its execution is to be effective. This usually requires the transformation of the prevailing cultural assumptions. A particularly difficult aspect of this task is that of making these assumptions explicit in order to understand which of them needs to be transformed. As subconscious phenomena, their explication represents a major leadership challenge.

3 The Challenge of Change

While past experience is a valuable asset when addressing familiar problems, this is not usually the case when confronted with problems and challenges that have never before been encountered. In situations where fresh thinking is required, the tacitly induced modes of interpretation and response acquired through cultural socialisation can become the proverbial 'stone around the neck' of individuals, companies and societies. Thus, the challenge that current organisations face is that of how to create a culture (a set of shared assumptions that facilitates appropriate interpretations of, and responses to, strategic inflection points) that allows a company to innovate (craft and enact new approaches to the novel situation it faces), while retaining a strong degree

of strategic flexibility. By strategic flexibility is meant the ability to anticipate emergent challenges (strategic inflection points) and continuously transform shared assumptions appropriately and timeously in order to survive and thrive within a highly dynamic business environment. To address this paradox a company needs to develop 'ambidextrous' capabilities where, somewhat schizophrenically, it builds the cultural capacity to exploit current possibilities while, simultaneously, enacting an alternative set of cultural predilections in order to explore and capitalise on new, different, opportunities in the future (see Chew and Dovey, 2014).

The challenge of change-and, in particular, the appropriate interpretation of problems and the conceptualisation of effective responses to these problems-is exacerbated by mental processes that manifest another set of assumptions known as mental models (see Senge, 1990; Kim, 1993). Formed as a consequence of our unique biographical experience, these assumptions about 'self, others, and the way the world works' screen our apprehension of events and situations such that our interpretations thereof are governed unwittingly by past experience. Thus, as Senge (1990, p.8) points out, mental models are:

> *"deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action."*

Acting in concert with cultural assumptions, the strong emotional dimensions of these tacitly formed personal assumptions rigidifies psychological defences against change, thereby ensuring that the past experiences of individuals unwittingly dictate their response to change in the present (Dovey et al., 2007; Kotter, 1995). In organizations where leadership is construed as an individual responsibility, this phenomenon has significant implications for the organization's capability to innovate.

As Schein (1988, p.30) points out, culture embodies the learning from past experience and thus it tends to be 'conservative' in relation to the future. Asking the question of which assumptions would underpin an innovation-supporting culture, he identifies the following list:

- control exists over the environment, with optimistic expectations that challenges can be addressed effectively through aligned, collaborative effort (the assumption of a 'collective' internal locus of control)
- risk is part of the process of pragmatic experimentation and failure is a valuable source of learning
- the time it will take for the innovation to be realised will be endured
- all stakeholders are capable learners who will embrace the challenge of change
- collaborative decision making is required to ensure the successful conversion of ideas into innovative new products, services, and practices [see Burdon and Feeny (2011) for an elaboration of this point].

The embedding of such assumptions into the everyday behavioural routines of all stakeholders thus becomes an important aspect of the leadership task of 'working with culture' in order to create an innovation-supporting social environment.

Regarding the issue of cultural assumptions about the phenomenon of leadership, the 'practice turn' in leadership (Crevani et al., 2010; Carroll et al., 2008) has introduced a new, radically different set of assumptions about the nature of leadership; one which shifts the focus from the individual-as-leader to that of the manifestation of collective assumptions in *practices* which endorse all stakeholders as innovators and, thereby, facilitate the conversion of creative ideas into innovative new products and services. In this respect, Jaruzelski et al. (2011, p.5) identify the following assumptions upon which, they argue, innovation-directed leadership appears to depend:

- that all parts of the organisation are inter-dependent and thrive on collaborative action
- that strong identification with the customer is vital
- that passion for, and pride in, products underpins the requisite resilience during the innovation process.

From a 'practice-turn' perspective, therefore, these assumptions need to manifest in collectively-reflexive everyday stakeholder practices. Furthermore, while the introduction of new organisational forms supported by new, incentivised, behaviours may offer easier ways to create an innovation-friendly social environment (as the 'skunkworks' strategy demonstrated in the past), the escalating speed of change is likely to require organisations to transform, chameleon-like, on an almost constant basis. Expecting individuals to manage such a complex task, for which there is unlikely to be time or capability, is unrealistic (the challenge of individuals, alone, being able to make their own, and others', assumptions explicit is already too great). Rather, the critical scrutiny and appropriate transformation of assumptions will have to be embedded in the everyday routines and reflexive practices of the stakeholder collective. As action research studies, located within the constructionist research paradigm, have shown, such collectively-reflexive action is critical to the realisation of innovative new products and services within organisations (Allen, 2015; Dovey and White, 2005; White and Dovey, 2004). While we endorse such studies, we believe that our adoption of a phenomenological methodology for the third form of data collection in this research, signals our belief that research located within the interpretivist research paradigm can contribute meaningfully to our understanding of the cultural antecedents of an organisation's capability to innovate [see Burrell and Morgan (1979) on this point].

4 Research Methodology

Three methods of data collection were utilised in this study. The first step in the data collection process involved a sampling exercise whereby we sought informed opinion on which organizations with an Australasian presence possess the most innovation-supportive culture. This was achieved by conducting an online survey of member enterprises of the Australian Information Industry Association (AIIA) during the fourth quarter of 2013. In addition to rating specified dimensions of their own organization's innovation capabilities, respondents were required to nominate three organizations in Australasia that they believed had the most innovation-supportive cultures (providing reasons for their choices). 244 people responded from the 102 enterprises represented in these responses.

Respondents' nominations for the top three Australasian (ANZ) organizations, with respect to having the most innovation-friendly culture, were analysed within four revenue turnover categories:

1. ANZ organization with an annual turnover of less than $2 million
2. ANZ organization with an annual turnover between $2 million and $50 million
3. ANZ organization with an annual turnover exceeding $50 million
4. Multinational company with an Australasian presence.

Our second phase of data collection occurred at the awards function, where the winner of each category was announced and the CEO, or a senior executive, from each category winner presented on the nature of his/her organization's innovation-supporting culture. As one of the reviewers of this paper commented, asking the organization's leadership to make explicit the assumptions which underpin the organization's everyday practices and routines in a 20-minute presentation, was

perhaps asking too much. The presentations, however, laid the foundation for a set of four case studies of innovative companies within fast-moving industry domains (for an explanation of the case study method, see Yin, 2003). Our research plan was to supplement the relatively superficial data gained from the presentations with richer data gained from the use of additional research methods. Each presentation was video-taped and analysed with the intention of identifying dominant or recurring themes, with respect to the creation of an innovative culture, across these four companies, as well as to highlight uniquely interesting insights conveyed by any of the presenters.

The final phase of data collection adopted a phenomenological methodology (see Moustakas, 1994). Through follow-up interviews with a senior manager in each of the four winning companies, the insights offered via the presentations were explored more deeply. Our assumption was that through the sustained everyday experience of their organization, those people selected for interview possess privileged insights into how its culture facilitates the innovative outcomes that AIIA members recognised through the survey. The focus of these interviews was, thus, to access more fully the knowledge of those who have deep experience of the phenomenon under research (namely, the nature of the shared assumptions that manifest in the everyday practices that support the organization's innovation capability). Through unstructured interviews that allowed the interviewees to create the constructs, and through the use of probing questions such as, 'can you be more explicit?'; 'tell me more about that?'; 'what do you mean by that?'; 'can you give me an example?'; etc., we attempted to gain insights into the deep structure of the culture of these organisations. Such sensitive, sustained, probing allowed us to delve deeper into the experiences of each interviewee, thereby enabling her/him to articulate knowledge that would not normally 'come to mind' easily. In this way, knowledge that is extremely 'sticky' [see Szulanski (1996) for the difficulties experienced in attempting to articulate tacit knowledge] became more accessible, allowing us to explore each interviewee's experience more deeply. The transcripts of the interviews were analysed independently by each of us and, following Heidegger (1996 edition) and Stahl (1993), we utilised the hermeneutic circle in our transcript analysis to achieve a rich understanding of the complex social practices and assumptions that underpinned the culture of each organization, based on the privileged knowledge of those interviewed. Thus, by utilising a range of methodologies, each assumed to be appropriate for the specific data collection task it addressed, we attempted to make as explicit as possible the cultural bases of the innovation capabilities of each of the winning organizations.

5 Results

An analysis of the survey results showed an inverse relationship between innovation capabilities and organizational size. Generally larger organizations were judged to have less innovation-friendly cultures than SMEs.

The nominations, by survey respondents, of organizations with the most innovation-supporting cultures delivered clear winners within each category of financial turnover:

1. QuintessenceLabs: (ANZ organization with an annual turnover of less than $2 million)
2. Xero: (ANZ organization with an annual turnover between $2 million and $50 million)
3. Atlassian: (ANZ organization with an annual turnover exceeding $50 million);
4. Google: (Multinational organization with an ANZ presence).

One outstanding feature of the four presentations at the awards ceremony was their

emphasis upon the leadership's strategic intent to innovate as a precursor to culture creation/transformation. Such intent, they argued, precedes and informs the culture creation/transformation processes that all view as fundamental to the innovation project. By articulating the strategic intent to innovate as a non-negotiable dimension of life within the organization, it is claimed that all stakeholders are given a clear message of 'what really matters' in terms of organizational priorities, practices and outcomes. This point was strongly endorsed by the senior manager interviewed in each of the four winning organizations.

Secondly, all four companies acknowledged the responsibility of the leadership to ensure that the company is structured in a way that enables the execution of the strategic intent. As the presenter from *Xero* pointed out, for staff to have genuine ownership of their work, and if bureaucracy is to be 'stamped out' of the workplace, a flat structure is required. In our interview with him, he goes on to argue that design is 'at the start and heart of everything' that is done at *Xero*, including the design of 'a platform that has enabled us to attract a large number of innovative technology entrepreneurs to come and build exciting new products that we integrate'. The presenter from *Atlassian* concurred, arguing that the organizational form should allow staff, once employed, to be 'set free' to 'become the change they seek'. During our follow-up interview we were told that, at *Atlassian*, staff members are encouraged to form virtual teams to facilitate innovative work outside of their normal teams, functions and organisational routines.

Thirdly, all four presenters conveyed the message that 'the strategy is the culture'; that is, that strategic intent must be underpinned by the creation of an appropriate culture whereby everyday action within the organization becomes aligned with that intent. In our follow-up interview with the founder/CEO of *Xero*, he expressed the sentiment, shared by all of those interviewed, that his organization is 'obsessed with having an innovation culture…and having an entrepreneurial spirit permeate throughout the organization regardless of how big we get'. A common theme across all four winning organizations is the conviction that at the heart of these innovation-supporting cultures is a set of cherished core values that are deemed to lay the foundation for decisive action in that they are not *espoused* values but, rather, *enacted* values. For example, at *Xero*, these values are centred on passion, embracing challenge, taking personal ownership, and creativity ('design is at the heart and start of everything we do'); while *Atlassian*'s values are (more starkly) stated as: open communication (no bullshit); don't exploit the customer; build with heart and balance; teamwork; and 'be the change you seek'.

Another stand-out cultural attribute of these four organizations (mentioned in all four winners' presentations and endorsed in follow-up interviews) is that of the importance of *collaboration* as a key source of ideation and innovation. The principle that 'all of us' are cleverer than 'any of us' informs the cultural imperative within these companies to seek creative ideas and to convert them into innovative products and services through the collective efforts of all stakeholders. While all of those interviewed mentioned the role that appropriate collaborative tools can play in supporting innovation, it was the value of *people* that was mostly strongly endorsed in all the presentations as being at the heart of innovation across these four companies. This is exemplified by *Xero*'s presenter who stated that his company's intent is to create 'beautiful accounting software' by 'solving people problems and not technical problems'. This emphasis on people takes multiple forms across these four companies. In particular, all stress the importance of the creation of a pipeline of talent through whose efforts innovative products and services will be realised. In these companies talent is conceptualised within a framework of complex, collectively-reflexive problem-solving practices. Individuals, driven by challenge and continuous opportunities to learn new skills and expand their knowledge base, are encouraged to

take ownership of their everyday action and, through reflexivity, disrupt the *status quo* by continuously questioning the assumptions that underpin the company's practices. As the presenter from *Google* (ANZ) put it, if their staff members 'are not doing some crazy things', they are 'doing the wrong things'.

In all four winning organizations the creation of a talent pipeline is seen as a responsibility of senior leadership. As *Xero*'s CEO explained, he wants 'to be really connected to that whole recruitment process and … to look at the culture fit of the people' being brought into the organization. The presenter from *Google* (ANZ) concurred, stating that as the need is for 'very passionate and curious people … hiring is the most important job that I do as a manager'. Once recruited, the *leadership* of talent was stressed by all representatives of these organizations. In particular, the following leadership practices were strongly endorsed:

- view all staff as entrepreneurs (endorsing risk-taking experimentation);
- encourage open and honest communication (eliminating any fear of 'speaking up')
- tolerate contrary perspectives (facilitating 'creatively abrasive' interaction)
- celebrate failure as a manifestation of appropriate risk-taking.

The assumptions underpinning all of these attributes are those relating to innovation being a human/social process that is enhanced by open and honest communication, strong interpersonal relationships, mission-pertinent learning and permission to experiment and fail. Furthermore, these attributes are also assumed to enable the kind of collaboration that transforms the politics of interpersonal engagement into positive forms where intellectual humility facilitates mission-pertinent learning (as one interviewee put it, to learn one must concede a degree of 'not knowing'). Furthermore, constructive confrontation is viewed in these four organisations as a form of 'intelligent caring'; that is, as a contribution to the individual's development and to the realisation of the company's strategic intent (rather than as a personal attack on others). In this way, in each of these companies, the requisite competitive spirit is framed by collaborative principles.

At *Google* (ANZ) 'innovation has to happen across the organization in every aspect of the business where everybody considers their job to be an innovator'. The presenter goes on to say that, 'every quarter, every team sets innovation goals across the business from engineering, business operations, finance and marketing' … (and) … 'to share all our knowledge we open up systems for security and competition, (which) makes us work faster'. Thus, by assuming that all staff members are innovators, innovation happens across the company and not just in Research and Development (R&D) centres. In this respect, the *Atlassian* presenter claimed that they periodically create teams, 'sometimes globally, sometimes within a single location, with the challenge to change something in 24 hours'. He elaborated on this challenge by describing a system for new graduates where they have to compete internally and produce a new product to go live by their first Friday in the job. Unusually, rather than attempts at incremental innovation that have characterised other companies' encouragement of employee engagement in innovation (such as those at Toyota towards the end of the last century), these companies all seek radical innovation through social practices that exploit the benefits of the innovation-focussed culture collectively created, and re-created, within these four organisations.

These findings reflect a new wave of organizations driven by the competitive imperatives of their industry to re-invent and re-create continually at a very fast rate. All four of these organizations are very customer-focused and comfortable with taking risks that could result in failure. Their culture encourages experimentation and radical innovation. They all have global perspectives and judge their progress through growth.

A provocative issue, raised in one of the winning companies, is that of the implications of geographic location with respect to the creation of an innovation-supporting culture. *QuintessenceLabs*, the winner of Category 1, only succeeded when, in spite of seeking university and investor support in Australia, overseas investors and customers recognised the potential of the idea on which the business is based. To date, all of their customers and investors are from outside Australia. This point raises questions about the role of broader, national, cultural assumptions in the development (and recognition) of organizations' innovation capabilities.

6 Discussion of Results

Drawing on Schein's (1985) definition of culture as a set of shared assumptions, this discussion of the results will focus upon the nature of the cultural assumptions held by the four winning organizations with respect to the phenomenon of innovation. What is explicitly clear in all the presentations and interviews is the assumption that innovation requires *people-centric* strategies. While some may not see this as a novel finding, for us it is revelatory given that all of these organizations are located in the technology sector-a sector dominated by positivist research oriented R&D departments (Allen, 2015). Almost every one of the results articulated above reflects an assumption that it is through people that organizations innovate. Furthermore, they endorse several people-oriented strategies with respect to building a culture in which the focus is upon:

- developing targeted talent selection practices
- exercising talent leadership by giving talent appropriate ownership of the innovation process and creating the social practices that facilitate collective reflexivity and learning
- ensuring that the structural form (socio-political environment) adopted by the organization encourages collaboration and allows open communication to become the norm
- explicitly endorsing the taking of necessary risks in doing what may be perceived by some within the organization as 'crazy things'
- constantly reviewing any 'business as usual' practices that constrain inquisitive exploration and which discourage critique of existing cultural assumptions regarding 'permissions' with respect to problem interpretation, and the nature of problem-solving processes.

These strategies endorse the findings of recent research into the leadership practices that underpin innovation capabilities. For example, Dovey and McCabe (2014) raise the issue of the management of selected talent once employed and the degree to which such talent-recruited to drive an innovation strategy-is unwittingly straitjacketed by prevailing business-as-usual procedures and systems (permissions, standards, incentives, performance management, resourcing, etc.). The cases that these authors offer, demonstrate how inappropriate assumptions that are embedded in the organizational structure and in leadership mental models, ensure that the rhetorically acclaimed strategy of innovation is impossible to implement. This echoes the findings of Henderson (2006) and Henderson and Kaplan (2005), on why smaller, more agile, organizations have greater innovation capabilities than larger, more rigidly structured, companies.

The results also endorse the research findings of Allen (2015); Karlsen and Larrea (2014); and Verhoeff (2011) in showing that social innovation precedes technical innovation. In the four winning organizations, social innovation involved the dismantling of the traditional hierarchical form of governance (thereby bestowing

ownership of the innovation process on teams), and the facilitation of learning by team members of how to generate and leverage the relationship-based intangible resources - such as trust, commitment, and resilience - required for the successful conversion of creative ideas into valuable new products and services. This supports Allen's (2015) finding that, at the core of socially transformative action (whereby the politics of innovation are effectively addressed) are social practices that facilitate the challenging of inappropriate interpersonal assumptions. As in Allen's (2015) study, these reflexive practices allowed, in particular, the critical scrutiny of assumptions that inhibited the risk-taking necessary for explorative learning. Such scrutiny was also applied to assumptions about 'the other': assumptions that undermined the processes of mutual identification required to generate the powerful 'identity resources' upon which each team drew strongly in its successful efforts at technical innovation [see Dovey and Mooney (2012) on the role of intangible capital resources in establishing a social platform for technical innovation]. Furthermore, each of the four winning organizations has developed a culture in which it is assumed that mutual openness to the correction or counsel of others, irrespective of status or role, is underpinned by a form of collective humility that allows each to learn from others; to admit to not knowing and to trust that such an admission would not be exploited for competitive advantage by others. As Allen (2015) shows, such cultural assumptions eliminate hubris, ego clashes, personality games, and other forms of destructive politics and set the stage for the collective focus on insightful learning that leads to significant technical innovation.

The findings of this study have profound implications for organizational leadership. They strongly endorse the claim by Schein (1985, p.5) that:

> *"culture creation and leadership, when one examines them closely, are two sides of the same coin, and neither can be understood by itself. In fact, there is the possibility-under emphasized in leadership research-that the only thing of real importance that leaders do is to create and manage culture and that the unique talent of leaders is their ability to work with culture."*

There is, thus, a growing sense that culture creation/transformation is becoming a critical leadership task and, as the results of this study show, this is particularly true in the case of organizations whose strategic intent is to innovate. The creation of an innovation-supporting culture, however, is an exceptionally challenging political task. As the results of this study show, technical innovation is founded on a base of social innovation of complex kinds that include the transformation of traditional organizational structures and, therewith, of traditional power relations. Success in this endeavor will, thus, require innovative leadership practices that engage the hearts, minds and imagination of all stakeholders.

7 Conclusion

Through this study we have attempted to contribute greater insight into ways of addressing the challenges of adopting innovation as a competitive strategy in the knowledge era. We have pointed out that these challenges are particularly significant for large organizations laboring under outmoded forms of enterprise logic, where structurally-embedded cultural assumptions undermine the execution of the intent to innovate.

In order to address the 'politics' involved in the execution of the strategy of innovation-a strategy that is intent on transforming the *status quo*-we located this study within the interpretivist research paradigm and adopted a 'leadership-as-practice' theoretical framework. From this perspective, leadership is viewed as a

collective inter-subjective achievement that manifests through collectively-reflexive practices aimed at addressing effectively the politics of cultural transformation and creation.

Through an analysis of four companies voted as having the most innovation-supporting culture by members of the Australian Information Industry Association (AIIA), through a University of Technology Sydney (UTS) designed survey, we have attempted to identify those cultural assumptions that underpin the practices that lead to successful innovation within these companies. The results show that in each of these companies, the 'collective achievement' of effective leadership of the innovation strategy is based on the demystification, and subsequent transformation, of reified cultural assumptions, and on experimentation with new forms of enterprise logic that spawn cultural assumptions that are more appropriate to the emergent and challenging business contexts in which these companies operate. This enterprise logic is characterized by more egalitarian relationships through which stakeholders are empowered to co-create and re-create work practices that assume co-ownership of the innovation project. In doing this, stakeholders are expected to take collective responsibility for the generation of creative ideas, and for generously supporting the creative ideas that are selected for conversion into innovative products and services. The politics of these relationships-competing interests and perspectives-are managed through reflexive practices that surface inappropriate assumptions in creatively-abrasive ways that strengthen the collective intent to innovate.

Whilst these companies collaboratively create and re-create the conditions for the development of appropriate cultural dispositions, those individuals with formal power in these companies play a significant role in establishing, and championing, the strategic intent to innovate as a non-negotiable dimension of company life. Furthermore they structure the company appropriately and create and manage the incentives (tangible and intangible) that offer talent an attractive value proposition. Through these practices, they set the scene for transformational action on complacency-by challenging any stakeholder assumptions that 'business as usual' can prevail-and signal their readiness to embrace risk and tolerate failure. Furthermore, by flattening the organizational structure and facilitating shared ownership of the innovation project, they provide indisputable evidence of their commitment to the 'cannibalization' of their traditional power base. Through this transformation of power relations (and interpersonal relations generally) they establish the social basis for innovative learning and explorative practices.

The manifestation of collective forms of governance of the 'culture creation/transformation' process occurs through a variety of leadership practices. Our results show that the successful execution of the 'high level' leadership practices (such as establishing the strategic intent to innovate) requires the effective enactment of more fundamental and specific practices. These include the building of a 'pipeline of human talent'; the empowerment of that talent to engage in innovation-related experimentation without fear of failure; and the retention of collective focus upon 'what really matters' in everyday workplace endeavor with respect to the sustained capacity to innovate. These practices demand management's committed engagement in the recruitment, and appropriate management, of talent, and in the development of the requisite social skills for facilitating the collectively-reflexive practices through which the politics of innovation are effectively addressed. Furthermore, the successful execution of these practices requires of management a self-reflexive capability whereby assumptions formed through previous work and life experience can be made explicit and transformed if necessary. In this respect, assumptions about the exercising of power; openness to learning (intellectual humility); embracing of risk; recognition of failure as a possible outcome of experimentation; and the (political) nature of innovation, in particular, are likely to require critical scrutiny. In addition,

this study shows that management facilitation of stakeholder *enactment* of a set of pre-eminent core values, and their use as *the* frame of reference in all decision-making, is an important feature of the cultural environment of the four winning companies.

While pointing to interesting leadership challenges with respect to building the organizational capabilities to innovate, the data-base on which this research rests is relatively small and this may have compromised the results. Furthermore, as a set of case studies located within an interpretivist research paradigm, the findings of this study are highly contextual and cannot be generalized to other settings with any degree of confidence. However, whilst the reliability of our results is not assured, the validity of such qualitative research is high. Not only does the research respect the integrity of the research phenomenon (that is, it does not reduce it to an operational variable), the adoption of a phenomenological methodology also facilitates a richer explication of this phenomenon. This explication is able to address value-laden (political) dimensions of the research phenomenon in ways that positivist research is unable to do.

The lead that the study offers, especially the principal finding that innovation-supporting cultures are generated by leadership practices that effectively address the politics of innovation, suggests a promising direction for future research to take. Such research, however, needs to be located within a research paradigm that can accommodate the political nature of innovation and its cultural antecedents. This study shows that, as a social construct, culture is a complex inter-subjective phenomenon; one which the traditional (and still dominant) research paradigm has had difficulty addressing effectively because of the ontological and epistemological assumptions that underpin it. In this respect, our findings indicate that the cultural basis of innovation capability may be better explored through alternative research paradigms that differentiate between social and natural reality.

8 References

Allen, G. (2015). *Leadership Practices for Innovation Realisation in High Technology Environments*. Unpublished PhD Thesis. Sydney: University of Technology Sydney.

Bourdieu, P. (1977). *Outline Of A Theory Of Practice*. Cambridge (UK): Cambridge University Press.

Burdon, S., & Feeny, D. (2011). Mobilizing for value added partnerships. *Journal of Information Technology Case and Application Research*, 13(2), 22-41.

Burrell, G., & Morgan, G. (1979). *Sociological Paradigms And Organisational Analysis: Elements Of The Sociology Of Corporate Life*. London: Heinemann.

Büschgens, T., Bausch, A., & Balkin, D. (2013). Organizational culture and innovation: A meta-analytic review. *Journal of Product Innovation Management*, 30(4), 763-781.

Carroll, B., Levy, L., & Richmond, D. (2008). Leadership as practice: Challenging the competency paradigm. Leadership, 4(4), 363-379.

Chew, E., & Dovey, K. (2014). Learning to create sustainable value in turbulent operational contexts: The role of leadership. *The Learning Organization*, 21(4), 243-257.

Crevani, L., Lindgren, M., & Packendorff, J. (2010). Leadership, not leaders: On the study of leadership as practices and interactions. *Scandinavian Journal of Management*, 26(1), 77-86.

Dovey, K., & McCabe, B. (2014). The politics of innovation: Realising the value of intrapreneurs. *International Journal of Learning and Intellectual Capital*, 11(3), 185-201.

Dovey, K., & Mooney, G. (2012). Leadership practices in the generation and deployment of intangible capital resources for innovation. *International Journal of Learning and Intellectual Capital*, 9(3), 295-306.

Dovey, K., Strydom, A., Penderis, B., & Kemp, P. (2007). Leading change in the South African district health service. *International Journal of Public Sector Management*, 20(3), 192-206.

Dovey, K., & Fenech, B. (2007). The role of enterprise logic in the failure of organizations to learn and transform: A case from the financial services industry. *Management Learning*, 38(5), 573-590.

Dovey, K., & White, R. (2005). Learning about learning in knowledge-intense organizations, *The Learning Organization*, 12(3), 246-260.

Drucker, P., Dyson, E., Handy, C., Saffo, P., & Senge, P. (1997). Looking ahead. *Harvard Business Review*, 75(5), 18-32.

Fisher, L. (2005). Semco's secret. *Strategy & Business*, 41(Winter Issue).

Gottlieb, J., & Willmott, P. (2014). *The Digital Tipping Point: McKinsey Global Survey Results*. Accessed 24th September 2014: http://www.mckinsey.com/insights/business_technology/the_digital_tipping_point_mckinsey_global_survey_results.

Heidegger, M. (1996 edition), *Being And Time*, (translated by J. Stambaugh). New York: State University of New York.

Henderson, R. (2006). The innovator's dilemma as a problem of organizational competence. *Journal of Product Innovation Management*, 23(1), 5-11.

Henderson, R., & Kaplan, S. (2005). Inertia and incentives: Bridging organizational economics and organizational competence. *Organization Science*, 16(5), 509-521.

Jaruzelski, B., Loehr, J., & Holman, J. (2011). The global innovation 1000: Why culture is key. *Strategy & Business*, 65(Winter Issue), 1-16.

Karlsen, J., & Larrea, M. (2013). *Territorial Development And Action Research: Innovation Through Dialogue*. Farnham (UK): Gower Publishing Limited.

Kim, D. (1993). The link between individual and organizational learning. *Sloan Management Review*, 35(1), 37-50.

Kotter, J. (1995). Leading change: Why transformation efforts fail. *Harvard Business Review*, 73(2), 59-67.

Kroeber, A.L., & Kluckhohn, C. (1952). *Culture: A Critical Review of Concepts and Definitions*. Cambridge (Mass.): Harvard University Peabody Museum of American Archaeology and Ethnology Papers *47*(1).

Miles, R., Snow, C., Mathews, J., Miles, G., & Coleman, H. (1997). Organizing in the knowledge age: Anticipating the cellular form. *Academy of Management Executive*, 11(4), 7-20.

Moustakas, C. (1994). *Phenomenological Research Methods*. Thousand Oaks (CA): Sage.

Naim, M. (2013). *The End of Power: From Boardrooms to Battlefields and Churches to States: Why Being In Charge Isn't What It Used To Be*. New York: Basic Books.

Rouse, J. (2007). *Practice theory*. Division I Faculty Publications. Paper 43.

http://wesscholar.wesleyan.edu/div1facpubs/43

Schein, E. (1985). *Organizational Culture and Leadership*. San Francisco: Jossey-Bass.

Schein, E. (1988). *Innovative Cultures and Organizations*. Sloan #2066, Boston: Massachusetts Institute of Technology.

Senge, P. (1990). *The Fifth Discipline: The Art and Practice Of The Learning Organisation*. New York: Doubleday/Currency.

Stahl, G. (1993). Supporting situated interpretation. *In Proceedings of the Annual Meeting of the Cognitive Science Society*, 965-970. Boulder (CO): Lawrence Erlbaum.

Szulanski, G. (1996), Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, 17(S2), 27-43.

Verhoeff, A. (2011). *No Technical Innovation Without Social Innovation: The Logic Of Social Innovation In Market-Oriented Firms*. Den Haag (Netherlands): AWVN

White, R., & Dovey, K. (2004). Knowledge construction in an Australian software development enterprise: Developing the knowledge bases for innovative renewal. *International Journal of Learning and Intellectual Capital*, 1(4), 405-415.

Whittington, R. (2006). Completing the practice-turn in strategy research. *Organization Studies*, 27(5), 613-34.

Williams, R. (1977). *Marxism and Literature*. Oxford: Oxford University Press.

Yin, R. (2003). *Case Study Research: Design and Methods* (3rd Edition). Thousand Oaks (CA): Sage.

Zuboff, S., & Maxmin, J. (2002). *The Support Economy: Why Corporations Are Failing Individuals And The Next Episode of Capitalism*. New York: Allen Lane.

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Using Twitter in the acceleration of marketing new products and services

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Abstract. The popularity of social media and microblogging services, like Twitter, has increased in a fast manner over the last couple of years. Their use in innovation process and marketing has also gained a lot of attention. However, product and service acceleration -i.e. bringing a product or service faster to the market- with the help of social media and especially by using Twitter has not been researched much, in spite of the fact that new marketing techniques like growth hacking -which aims on low-cost and innovative alternatives to traditional marketing- have reached popularity. In this paper, we define the concept of acceleration and analyse via literature and a real-life, explorative case study, how Twitter could be used for accelerating products and services. Our case study analyses the experiences and data from four Twitter accounts created for accelerating two software applications. According to our research, Twitter has potential for product and services acceleration, but it requires taking into account many aspects and challenges that are summarized in this paper.

Keywords. Twitter, Acceleration, Social Media, Innovation.

1 Introduction

Social media has become a very popular channel for engaging consumers with brands and products. According to Kaplan and Haenlein (2011) social media is an umbrella term that includes various applications, such as blogs, social networking websites, content sharing websites for videos and photos, consumer product or service ratings websites, Internet discussion boards and forums, company sponsored discussion boards and chat rooms. In go-to-market and promotion, social media provides companies great new opportunities as it enables companies to talk directly to their customers, and customers to talk to each other (Mangold and Fauds, 2009). Successful adoption of social media also increases the turnover of companies (Tsimonis and Dimitriadis, 2014), but in order to succeed, companies need to understand how to communicate and follow the discussion in social media (Kietzman et al., 2011). Viral marketing (Rayport, 1996) or electronic "word-of-mouth" communication, whereby a marketing message is transmitted in an exponentially expanding manner at seemingly small cost, has become possible with social media and social networking services.

Our paper looks at the use of social media for the acceleration of marketing new products and services. With this term, we refer to a combination of processes, tools and methods that help companies get new products to the market effectively. The effectiveness comes from being able to reach potential users quickly and to get feedback of the product and its features, so that it will be possible to react quickly to the needs of the users. Social media, and Twitter in particular, seem like a big opportunity for product acceleration.

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Since its launch on July 13th, 2006, Twitter has become a popular microblogging service. The potential for viral marketing is one of the main factors increasing the interest of corporations in the microblogging service Twitter (Asur and Huberman, 2010). Twitter had 645 million registered users in 2014 (Statistic Brain, 2014) of which 271 million are active on a monthly basis (Twitter, 2014). The users of the service can publish short messages, called *tweets,* with the maximum size of 140 characters. Users can also easily resend (i.e. *retweet*) other users' tweets, which is the key feature in spreading messages quickly within the service (Asur and Huberman, 2010) and to extend the spread outside the direct followers of the original tweeter (Bruns and Burgess, 2012).

The magic of Twitter was its simplicity, but what has made the service really grow is the fact that the users can follow any other user without approval (Bodnar and Cohen, 2011). Twitter is widely used in interaction between brands and consumers, but when dealing with new products and services with no existing followers, its use for acceleration becomes more challenging.

Each Twitter user may create a brief profile including full name, location, web page, and short (140 character) biography. Twitter shows information about each user, who has not limited the visibility of their data, the number of tweets and photos/videos they have published, the numbers of followers and following, as well as, who they are, the number of favourites and lists followed. Users can communicate publically by using the @username notation, or between the followed and followers using private messages. Twitter tracks phrases, words, and hashtags (a word marked with #) and shows the most popular ones as "trending topics" (Kwak et al., 2010). A hashtag becomes a link, making it easy to see what other users are currently posting in relation to the hashtag. This is the second important way to reach beyond direct followers (Bruns and Burgess, 2012).

Earlier, a tweet could contain only text and links, but since 2014, it became possible to also include pictures. The limited message size in Twitter is both an advantage and disadvantage. Users need to condense their message to a very short space and this usually limits the tweet to include only one topic. However, short message may be hard to understand (Jussila et al., 2013).

Twitter was selected as the research topic of this paper for various reasons: a Twitter user account is quick and easy to set up, there is no need to link the user account to a real personal or corporate identity and the user is free to follow any other user without mutual agreement. These features are beneficial when aiming at gaining visibility to a new product in the early phase and without big advertising campaigns.

This paper aims at understanding whether Twitter is a good tool for acceleration of a new product by answering to the following research questions:

> ***RQ1:*** *What are the challenges of using Twitter as a tool for acceleration?*
>
> ***RQ2:*** *What kind of lessons learned can be extracted for using Twitter as a tool for acceleration?*

The remainder of this paper is structured as follows. Chapter 2 presents related research on the topic. Chapter 3 of this paper presents the research questions, method and design. Chapter 4 presents two case studies where Twitter has been used in acceleration. Chapter 5 discusses the results and limitations and draws the conclusions and presents directions for further work.

2 Related literature

The following section presents related literature from the topics of social media with

the emphasis on Twitter and acceleration.

2.1 Social media and Twitter

Literature on Twitter is wide and extensive, so we present here the most referred articles and articles that relate to acceleration of services and products.

Huberman et al. (2008) analysed in their paper the social interaction of people in Twitter by collecting and analysing a large data set from the Twitter. Their data set consisted of 309,740 users. This research showed that most of the links declared within Twitter were meaningless from an interaction point of view and that the driver of usage is a sparse and hidden network of connections underlying the declared set of friends and followers.

Jansen et al. (2009) investigated microblogging as a form of electronic word-of-mouth for sharing consumer opinions concerning brands. They analysed the overall structure of the microblog postings, the types of expressions and the movements of positive or negative sentiments in more than 150,000 microblog postings containing branding comments, sentiments and opinions. They found out that microblogging is an online tool for customer word of mouth communications and discuss the implications for corporations using microblogging as a part of their overall marketing strategy.

Asur and Hubermann (2010) demonstrate in their paper how social media content can be used to predict real-world outcomes. Asur and Hurbemann (2010) focused on predicting box-office revenues for movies using the chatter from Twitter. The survey extracted 2.89 million tweets referring to 24 different movies released over a period of three months. According to the survey there is a strong correlation between the amount of attention a given topic has (in this case a forthcoming movie) and its ranking in the future.

Cha et al. (2010) presented in their paper an empirical analysis of the influence patterns in Twitter by making an in-depth comparison of three measures of influence: in degree, retweets, and mentions. Their Twitter dataset consisted of 2 billion follow links among 54 million users who produced the total of 1.7 billion tweets. Their analysis showed that the most influential users can exercise significant influence over a variety of topics, but that influence is not gained spontaneously or accidentally, but through concerted effort.

Kwak et al. (2010) studied the topological characteristics of Twitter and its power as a new medium of information sharing by analysing 106 million tweets. The results of Kwak et al. (2010) show that once retweeted, a tweet gets retweeted almost instantly, implying fast diffusion of information after the first retweet.

Spaulding (2010) studied how various types of virtual communities can create value for business. The study included transaction oriented communities like eBay[1], interest oriented communities like topic specific discussion board, relationship oriented communities like social networking sites and fantasy oriented communities like those in a virtual world like Second Life[2]. The study showed clearly that in order to succeed companies must play by the rules of the community. The author's conclusion was that a mix of interest and relationship oriented communities offered the best potential for companies to find and train customers to co-operate and support their products.

Soboleva and Burton (2011) analysed in their research the use of Twitter in 12 accounts held by six organizations in the USA and Australia. According to Soboleva

[1] http://www.ebay.com/

[2] http://secondlife.com/

and Burton (2011) Twitter can ideally provide a highly interactive one-to-many information channel by using a combination of retweets, hyperlinks and hashtags to promote positive messages. Twitter can also provide easy access to information by pushing the users to an internal web site. Lack of consistency across company accounts suggests that many organisations themselves are not sure of their best Twitter strategy (Soboleva and Burton, 2011).

Li and Li (2014) studied consumers' evaluation of brands by evaluating how consumers reacted to the tweets of a (fictitious) brand when dividing the users into two groups based on their level of Twitter use (light or heavy). Their study supported the hypothesis that heavy users have a more communal relationship with Twitter than light users, and this reflects to their reactions to brand messages. A heavy user is almost, as likely to retweet a communal message, as an exchange message with an offer. Light users relationship with Twitter is described as an exchange relationship, which means that they expect to get some benefit of their actions. Li and Li (2014) conclude by pointing out that when using a social media site for interacting with existing and potential customers, it is important to understand why and how people are using a particular social media service and to match the company presence and activities to that. They suggest using communal messages if the aim is to build a strong brand community and messages emphasising benefits, when the aim is to increase brand awareness or launch a new product.

Roberts and Candi (2014) surveyed managers in 351 European companies about their companies' use of social networking sites in new product development (NPD) in three different aspects: market research for NPD, customer collaboration in NPD and New product launch, as well as, of their results in these areas. The best success had been gained in using social network sites for new product launch. Customer collaboration in social networking sites had contributed to increased innovativeness, whereas no benefits had been gained in market research. The study indicated that companies had not fully learned to utilise social media in the more complicated aspect, such as, market research. The use of social networks is easier when launching the actual product as options like user reviews can be encouraged and spread through user networks. The authors urge companies to think carefully in which tasks to involve users via social media. Obviously, focusing at social media channels with enough users that belong to the intended target audience is important. The use of an open social media environment also brings about risks in the form of false, misguiding and not authentic contributions and even malicious users.

2.2 Acceleration

In the literature, the concept of **acceleration** has various meanings and therefore the concept needs clarification. We have defined acceleration (Apilo et al. 2015) as a combination of processes, tools and methods that help companies go faster to the right market. Our approach is planned to fit all kind of companies from start-ups to mature organisations. Figure 1 below presents the acceleration concept used in this article.

The main phases of the continuous learning process in acceleration are opportunity mapping, business model, minimum viable product (MVP) and validated learning.

Opportunity mapping defines a space of possibility by helping to zoom in on the problems that the users want to solve and to identify the spaces where competition is still limited. Opportunity mapping also rearticulates problems and needs in a generative and future-oriented way (Anon, 2015).

According to Al-Debei et al. (2008, p.8-9) a "business model is an abstract representation of an organization, be it conceptual, textual, and/or graphical, of all core interrelated architectural, co-operational, and financial arrangements designed and developed by an organization, as well as all core products and/or services the

organization offers based on these arrangements that are needed to achieve its strategic goals and objectives."

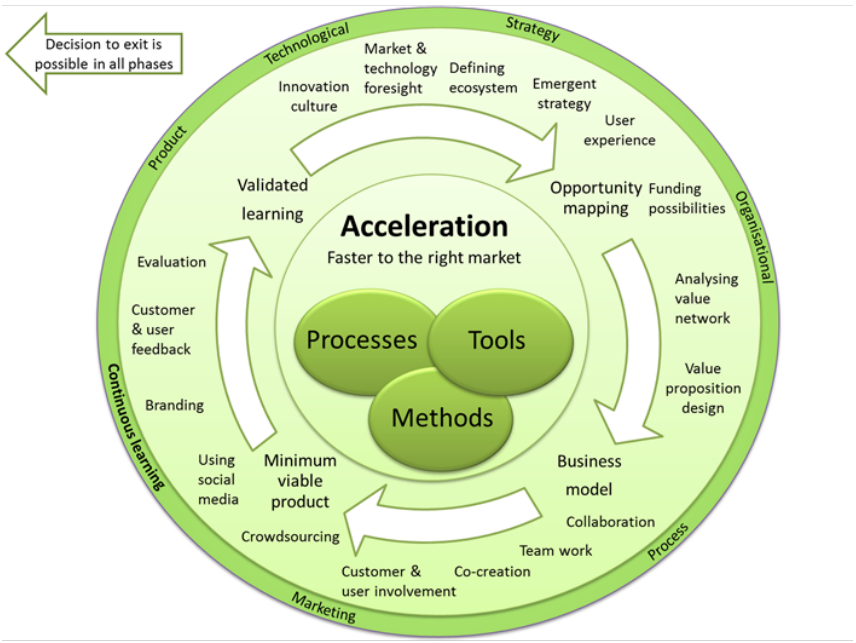

Fig 1. Acceleration concept.

The business model reflects management's idea about what customers want and how an enterprise can best meet these needs and get paid well for doing so (Teece 2010). The business model canvas developed by Osterwalder and Pigneur (2010) has become a very popular business modelling tool.

MVP is "the version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort "(Ries, 2009). MVP contains only the critical features of a product (Blank, 2013).

Ries (2011, p.46) defines validated learning as "a rigorous *method for demonstrating progress* when one is embedded in the soil of extreme uncertainty in which start-ups grow". The idea of validated leaning is to learn by trying out an initial idea and then measuring it to validate the effect. Validated learning is especially popular on the Internet, where visitor behaviour can be tracked by analytics software and real functionality of the website features can be analysed by e.g. using statistics.

In using Twitter, the biggest potential of acceleration relates to the MVP phase, when a working service or product has been defined and built and made available for real users. Even though the product or service has not yet been completed to the full, it can give users the core idea and practical experience of using it.

In software development, MVP is often referred to as beta: it generally begins when the software is feature complete, but may contain bugs and performance issues. Beta release is a pre-release of software that is given out to a large group of users to try it under real conditions. Beta testing may be done in various levels of openness: it may be 'by invitation only', beta users may ask to get access by registering at an open website, or the product is launched as a beta version for anyone to use. For Android applications (apps), Google gives the opportunity to launch alpha and beta versions of

an app through Google Play[3]. The difference to normal versions is that alpha and beta testers cannot rate the app and in this way it cannot hamper the future success of the app. Other channels, including Google services like Google+ or Twitter need to be set up in order to gather the user feedback on these alpha and beta apps.

In the case study of this paper, a marketing technique called growth hacking has been used as the model for action in gaining exposure for an idea or product (Mohout, 2014). Growth hacking, uses analytical thinking, product engineering and creativity so as to sell products and gain exposure (Biyani, 2013; Rowan, 2014). Growth hackers focus on low-cost and innovative alternatives to traditional marketing, e.g. utilizing social media and viral marketing instead of buying advertising through more traditional media, such as, radio, newspaper and television (Biyani, 2013). Growth hacking has, according to Mohout (2014), five phases: acquisition, activation, retention, revenue and referral. In the acquisition phase, the idea is to get in touch with the customer (e.g. by using Twitter). In the activation phase, the goal is to provide the users with a great first experience and in the retention phase, to get them to come back. The revenue phase aims at making money and the referral phase at getting users to tell others about your product. The phases of growth hacking do not necessary follow each other strictly in this order; particularly the referral phase can occur before the revenue phase. Bulygo (2013) has gathered 35 resources with ideas and approaches by using growth hacking and becoming better in it**.**

As acceleration is not a well-established term, related literature has been searched in this article by using a wider terminology.

Datta (2009) investigates in his article how a company's ability to explore and exploit affects its ability to commercialize innovations. Datta (2009) found out that IT based knowledge capability is found to positively moderate the relationship between ability to explore and exploit and commercialization of innovations.

Engel (2011) investigates in his article the ten leading strategies employed by venture capitalists and entrepreneurs to test new ideas and commercialize innovations quickly. The most successful innovations are, according to Engel (2011), those that go beyond technical discovery so as to embrace business model innovations that disrupt supply chains and create new markets.

The articles of Fitzgerald (2013), KPMG (2014) and Pantaleo and Pal (2008) analyse acceleration. Fitzgerald (2013) analyses in his article the implementation of digital acceleration teams at Nestle. A report by KPMG (2014) presents how to accelerate implementation of eHealth solutions. Pantaleo and Pal (2008) analyse in their book the global change of acceleration and its impact on the innovations and their marketing.

The "Digital aspects of acceleration" by Webb (2011) presents comprehensive case examples of how organizations have deployed Digital Innovation methodologies to grow both sales and profit and how organizations are using digital media, Web 2.0 and social media to connect to their customer communities and internal stakeholders.

3 Research method and data collection

In this study we wanted to evaluate opportunities and challenges of using Twitter in acceleration of marketing new products in connection to the MVP phase when the product is offered using a fictitious brand that does not have presence or existing user networks. This situation is faced by a new company or a company that wants to test

[3] http://developer.android.com/distribute/tools/launch-checklist.html

new product ideas with real users in a sector that does not know well and does not make a direct link to its existing brand(s) or user communities. In this study, the term product means application as the products of our case study are software applications.

The aim of this paper is find out, if Twitter is a good tool for acceleration of a new product without existing followers, and for this purpose, we have defined our research questions as follows:

> ***RQ1:*** *What are the challenges of using Twitter as a tool for acceleration?*
>
> ***RQ2:*** *What kind of lessons learned can be extracted for using Twitter as a tool for acceleration?*

Case studies have proven to be useful in situations in which the target is to understand a contemporary phenomenon in complex, real-world settings, especially when the boundaries between the context and the phenomenon are not clear (Yin, 2003; Eisenhardt, 1989). An *exploratory case study* aims towards seeking new insights, understanding what is happening and generating new hypotheses and ideas for future research (Robson, 2002).

The research presented in this paper was conducted as an explorative case study of two different case projects that have focused on using Twitter for acceleration of two new applications. Two case projects and their four Twitter accounts were the units of analysis in this study. However, since each of them had a single goal of understanding how social media can be used in acceleration, the case study can be seen as holistic (Yin, 2003). The experiences of the account maintainers are qualitative data in the form of notes. The performance of the tweets, as well as, the characteristics of the followers were analysed by using numerical data to describe these cases and not to make general conclusions of Twitter users and tweet performance. Two of the authors of this paper had created and maintained the four Twitter accounts analysed in this study. This means that we had all the available private and public information in relation to the accounts.

Two datasets were obtained in order to analyse the tweet performance and follower characteristics. Twitter offers the impression and engagement data to each account owner of their original tweets. We call this dataset internal data. It contains information of various types of interactions and activities that Twitter users have made with the tweets. Some statistics were available since the accounts were created, but complete interaction data was available only starting from the end of August 2014.

In addition to the internal dataset, we gathered data through the open Twitter API of the followers of each account. This will be called the API dataset. The API dataset gives a different view than the internal dataset and complements it. The internal dataset describes how the original tweets made by the account "performed", whereas the API dataset lets us examine followers' features and activities.

Detailed analysis of user behaviour utilising users' digital footprints is widely used with success to understand user needs and to develop websites for maximum impact (Wilson, 2010; Bucklin and Sismero, 2009). In the case of Twitter, we need to adapt our analysis to what data Twitter offers. Our case can be regarded as analogous to making research on advertising. Traditionally the number of people who saw an advertisement has been a central measure; in online environments, also the actions that users take based on an advertisement can be measured. Twitter provided data offers both types of data and they will be utilised in this study.

The case study dealt with four Twitter accounts: *Funnyhat Dudes*, *Bass Manic Gorilla*, *Secure Selfie Crew* and *Privacy for Cats* used for promoting two apps, *Funny Hat Stickers* and *Secure Selfie Camera*. These apps had been developed as a part of a company's internal light-weight development process, where small apps aimed at

totally new customer groups and markets are developed in order to explore new opportunities. The budget for product development is small and one of the challenges faced by the developers is how to test whether their app gain any traction among real end users. Getting users' attention to new apps in a crowded online store, like Google Play, is very hard and because of the limited budget, there is no opportunity to advertise these apps, or to grow and maintain a longer-term user community. The developers, however, needed quick and efficient ways to bring their product to the attention of potential users. Twitter with its hundreds of millions users and easy and a quick-paced interaction seems like a potential place for finding users and a test market for the app with a small budget, giving also the opportunity to the developers to interact with the potential users directly.

Funny Hat Stickers was developed and published at Google Play[4] in May 2014 and Secure Selfie Camera[5] in November 2014. At the end of January 2015 the Funny Hat Stickers application had been downloaded 10,553 times and the Secure Selfie Camera 1,212 times. Twitter has been utilized to obtain visibility to the apps and to encourage people to try the applications themselves.

The developers set up two Twitter accounts to promote the Funny Hat Stickers app: Funnyhat Dudes[6] (@funnyhatdudes) and Bass Maniac Gorilla[7] (@heavyshrimp). The Secure Selfie Camera app has been promoted with two Twitter accounts: Secure Selfie Crew[8] (@SelfieSec) and Privacy for Cats[9] (@KittenPrivacy).

Table 1. Description of the analysed accounts.

Account	Description
@funnyhatdudes	*"We love #appdev for #android. Download our free Funny Hat Stickers http://bit.ly/1mMoczi."* - An app developer account - Includes link to the app in the Google Play.
@heavyshrimp	"*An almost retired #bassist and a #funart & #fanart wannabe w/ http://bit.ly/1mMoczi: #happiness & #fun belongs to #rock & #metal. #followsback great stuff! ".* - Targets people who are interested in heavy music and playing with photos and finding funny things. - A shortened link (bit.ly/1mMoczi) is included, and it leads to the app in Google Play
@SelfieSec	*"Creators of the Secure Selfie Camera app for #Android. We exist to protect #photos that need the extra care: #private, #intimate, #confidential, or #sensitive."* - Description is directly linked to the app
@KittenPrivacy	"*A #cat owner and privacy advocate! A member of @selfieSec crew. Hey #cats, be aware of your privacy when taking intimate #catselfies!"* - Also refers to the Secure Selfie Camera app, but takes a less serious approach by combining privacy with the popular cat images

[4] https://play.google.com/store/apps/details?id=com.dfdata.funnyhat

[5] https://play.google.com/store/apps/details?id=com.dfdata.secureselfiecam&hl=en

[6] https://twitter.com/funnyhatdudes

[7] https://twitter.com/heavyshrimp

[8] https://twitter.com/SelfieSec

[9] https://twitter.com/KittenPrivacy

The maintainers of the accounts grew the number of followers by starting to follow users that somehow seemed relevant to the user account and by retweeting and making favourites of other users' tweets. Also tweets mentioning other users were posted directly. The aim was to try to get other users as followers, since followers will see future tweets in their Twitter home page and in this way there will be an opportunity to get them interested in testing the developed apps.

Getting followers was done according to Twitter guidelines[10], in other words, no automation and no mass friending or unfriending or aggressive churning. It is, however, necessary to unfriend such followers who do not follow the account after the account is following more than 2,000 users. This is because Twitter starts to limit the ability to follow new users if the ratio of followers and following does not fulfil the Twitter defined value.

4 Case study results

This section presents the lessons learnt from managing the case accounts and after that, goes more into details by presenting the quantitative analysis of the tweets and followers of the Twitter-accounts

4.1 Lessons learnt from managing the case accounts

The experience from maintaining the four case accounts confirmed the usefulness of the following practical hints/guidelines given in the literature (Angels, 2014; Bodnar and Cohen, 2011; Bullas, 2012; Malhotra et al., 2012). To get attention it was important to have interesting wordings, use attention words (like WOW), create a sense of anticipation, incentivize and optimize the use of keywords. To gain followers it was useful to take advantage of existing networks and use available tools to assist in managing the Twitter followers and following. The more credible the account looked with existing followers, the more likely new users were to follow it back. Creating a human connection and remembering that people want to be recognized and tweeting with purpose and passion contributed to the positive attention from other users.

Creating and sharing content that was relevant to followers and good enough to be retweeted was important. "Evergreen" content was helpful, as it could be used in tweets several times and any time. Multimedia content and photo tweets got more attention than text only. Posting tweets with different focuses like educating, entertaining, inspiring and not just informing was good. The attention that a tweet gets depends also on luck and the account holders could not in advance guess, which tweets would get the most attention. This means, that it is important to be very active and try many things and not to be afraid of mistakes.

Internal training will be needed to encourage developers to participate in Twitter. The training should give ideas as to how to invent good tweets, how to utilise Twitter features, such as, photo embeds and how to utilise the same content multiple times without being too repetitive. Guidelines as to how to best grow the follower base considering Twitter rules and restrictions need also be given, as well as, various practical tips on how to use the system and its strengths and avoid limitations.

If several people concurrently post to one account, common shared idea of the account interests and topics for tweets should be agreed, as well as, the general

[10] https://support.twitter.com/articles/68916-following-rules-and-best-practices

atmosphere that the account tries to create. The overall tone for the account should be defined.

Practice showed that there are also limitations on use of Twitter. First, even though there is a social element in Twitter, it turned out not to be a suitable platform for getting user feedback on the apps. When developing software, the primary channel for feedback must be within the app. Second, the success of a Twitter account in promoting an application can only be partly measured as Twitter statistics only captures the direct app installs. The Twitter analysed statistics only showed few downloads but the total number of the Funny Hat Stickers app downloads has reached more than 10,000. The Funny Hat Stickers app has been promoted only via Twitter, so the impact of the Twitter presence and accounts has probably played an important role in making the app known and encouraging downloads.

4.2 Case Twitter accounts

This section presents the main characteristics of the analysed Twitter accounts and the impressions and user engagement related to their tweets.

Main characteristics. The number of tweets that had been published through the four case accounts varied from 233 to 989 including retweets; the numbers of followers varied from 1085 to 2554 and of following from 1425 to 2805 (Table 2). In all cases, the number of users being followed was higher than that of followers, which is to be expected with this type of a new account. The numbers of followers are higher for the less serious accounts than for the more official ones.

Table 2. The numbers of tweets including retweets, followers, following (followed users) and favourites of the four case accounts.

	@funnyhat-dudes	@heavy-shrimp	@SelfieSec	@Kitten-Privacy
Tweet count	989	524	744	233
Followers	1 841	2 554	1 085	2 290
Following	2 019	2 805	1 425	2 493
Favourites	497	1 062	97	1 533

Figure 2 shows some key activities for the four accounts.

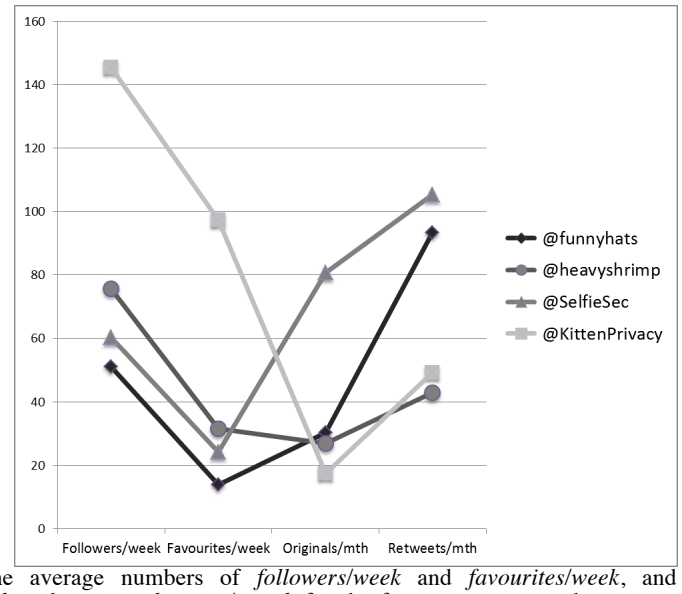

Fig. 2. The average numbers of *followers/week* and *favourites/week*, and of *original tweets/month* and *retweeted tweets/month* for the four case accounts between account set up and mid-December 2014.

The number of followers had increased most rapidly for the @KittenPrivacy account. Lessons learnt from developing the previous Twitter accounts were used there, such as, quickly unfollowing the followers that had not followed the account. The @KittenPrivacy account had been the most active account in marking favourites. Both original and retweets had been published most frequently through the @SelfieSec account, but it has the smallest number of followers. The difference in the popularity of the @KittenPrivacy and @SelfieSec accounts is most likely because of the difference in the topic; the privacy of photographs is a much more difficult topic than funny photos of cats and therefore, it does not attract followers as easily.

Impressions and engagements. The internal dataset provided detailed information of the tweet impressions and user engagement with tweets. Impressions indicate to how many people the tweet was shown. Engagement is a summary measure of the different ways and numbers of engagement that users may do with tweets, such as, retweeting and making a favourite, but also clicking the user profile, URL or hashtag in the tweet.

Table 3 provides the statistics of the overall performance of the tweets. Single tweets published through the @funnyhatdudes and @SelfieSec accounts had received the highest number of impressions, but when measured with the mean or median, the @KittenPrivacy account had reached the highest impression and engagement levels. @KittenPrivacy had also reached the highest score in the engagement for one single tweet. The three other accounts had all very similar averages for impressions and engagement.

Table 3. The number of tweets and the impressions and engagement statistics for the four case accounts.

	@funnyhatdudes		**@heavyshrimp**		**@SelfieSec**		**@KittenPrivacy**	
Tweet count	242		128		296		53	
	Impressions	Engagement	Impressions	Engagement	Impressions	Engagement	Impressions	Engagement
Max	39 301	66	4 258	144	11 658	194	5 470	264
Min	13	0	8	0	11	0	36	0
Mean	518	7,1	490	7,6	494	5,8	1 352	59,2
Median	251	5	241	5	154	2	1 002	32

The @KittenPrivacy account got the highest overall engagement values also when measured as the percentage of tweets that got at least one user interaction, as can be seen in Table 4. @SelfieSec, the account that aimed at promoting the same app, but with a more serious approach, got the lowest level of interaction in most categories. Out of the @SelfieSec tweets, 31% did not get any reaction. URL clicks and user profile viewing was the most common ways of user interaction for this account.

Table 4. The percentage of tweets that got an engagement activity by at least from one user (the highest value in bold and the lowest value underlined).

	Engagement	Retweet	Reply	Favourite	User profile click	URL click
@funnyhatdudes	93%	24%	15%	43%	35%	51%
@heavyshrimp	91%	34%	28%	55%	45%	37%
@SelfieSec	69%	30%	5%	22%	30%	34%
@KittenPrivacy	**94%**	**72%**	**38%**	**81%**	**68%**	**57%**

	Hash tag clicks	Detail expand	Perma-link click	Embedded media click	App install	Follow
@funnyhatdudes	**26%**	58%	0%	52%	0%	1%
@heavyshrimp	4%	60%	2%	26%	0%	5%
@SelfieSec	15%	29%	0%	8%	**1%**	*1%*
@KittenPrivacy	6%	**89%**	**4%**	**62%**	0%	**9%**

Figure 2 showed that the @KittenPrivacy account had been much more active in making favourites than the other accounts. Table 4 shows that this activity has been mutual: 81% of the tweets published by the @KittenPrivacy account were favourited by at least one user. Also the values for retweeting (72% of the tweets) and detail expands (89%) were very high for this account. Detail expands and marking as a favourite were very popular ways of interaction also for the @heavyshrimp account, but the overall levels were lower.

Also the @funnyhatdudes account tweets had a high overall engagement level, but the interactions were more evenly spread among the different options than for the

@KittenPrivacy account tweets. Detail expands, embedding media and URL clicks were the most popular activities in connection to the @funnyhatdudes tweets, but it was very low in retweeting.

The success in app installs, the main goal of setting up the accounts, was low, only a few click through the official user accounts. Two @SelfieSec tweets had led to somebody clicking the link to app store. One @funnyhatdudes tweet had got two persons to click the link to the Google app store. These tweets had clear text that asked the user to get the app. There were other tweets with a similar clear message, so it does not automatically lead to action, but, helps in getting people to act.

4.3 Case accounts' followers

This section presents the main features of the followers of the case accounts and of those users who retweeted case account tweets or replying to them.

Followers' main features. The API dataset from Twitter describing the followers of each case account was gathered at mid-January, 2015. Table 5 presents the information retrieved of each follower for the analysis.

Table 5. Data retrieved of each follower through the Twitter API.

User account age
Language
Number of tweets in total
Number of followers
Number of following users
Number of favourites
Number of lists
Number of tweets in last 90 days (max. value 400 tweets)
Retweet percentage of the last 400 tweets (or less if the user had published less than 400 tweets)
Number of replies to the brand account in the last 400 tweets (or less if the user had published less than 400 tweets)
Number of retweets of brand tweets in the last 400 tweets (or less if the user had published less than 400 tweets)

The value of 400 tweets is the upper limit to the number of tweets during the last 90 days; this value comes from a practical limitation of the Twitter API, which lets one request tweets in a batch of 200 tweets. To see how many tweets each user had made during the last 90 days, we fetched two batches of 200 tweets from each user and counted how many of them had been posted during the last 90 days. Some users had, however, posted 400 tweets in less than 90 days, so the value of 400 means that the users had most likely posted more than 400 tweets during the last 90 days. It is also good to remember that some users had not posted 400 tweets during all their time in Twitter.

The basic characteristics of all followers of the four case accounts combined are presented in Table 6. Little more than half of the users were following less than 2,000 users, which is the area where Twitter does not limit the users' ability to follow additional users.

We have also included as a comparison, the estimate of the number of followers in Twitter for all accounts according to a study[11] published in 2013. We can see that the

[11] http://radar.oreilly.com/2013/12/tweets-loud-and-quiet.html

followers of the case accounts had many followers when compared to the general level. This difference was expected as there are many user accounts in Twitter that are used little and such accounts are unlikely to follow other users. Even though we take this into consideration, the overall level of tweets, followers and following can be considered high for the case accounts.

Table 6. Key characteristics of the Twitter users that followed the analysed case accounts in the API dataset.

	10%	20%	40%	**50%**	60%	80%	90%	95%	Max 99.9%
Days in Twitter	168	263	527	**712**	934	1 515	1 961	2 114	2 989
Tweets	86	263	1,190	**2,289**	4,084	15,549	35,873	61,832	627,252
Following	323	636	1,507	**1,968**	2,876	17,197	56,988	121,010	940,774
Followers	183	410	1,068	**1,681**	3,164	20,675	71,579	147,283	2,139 724
All Twitter users' followers	*3*	*9*	*36*	***61***	*98*	*246*	*458*	*819*	*24,964* (99.9%)

Huge differences in the user activities could be seen in the data. Some account owners had been extremely active: almost 30% had been sending more than 10 tweets per day during their whole time in Twitter. About one third of the followers of the case accounts had got more than 10 followers per day, or follows more than 10 new users per day. The top values for followers/day are higher than for following/day, which is natural as one popular account may be followed by numerous new users every day, but there is a limit as to how many accounts one person can follow during one day. The top values for following per day are actually higher than what can be regarded as feasible to a real person to manage without automation.

The @KittenPrivacy account followers had the lowest average value and the narrowest range of values for daily new followers and following. The values were not much higher for the @heavyshrimp account followers. The @funnyhatdudes account followers had the highest values and widest range of the four case accounts in these measures.

The numbers of followers and following have a high correlation as it can be seen in Figure 3 where a scatterplot of the number of following and followers in log10 is presented. The scatterplot reveals clearly the Twitter policy of limiting the users' ability to follow new users after they have reached the limit of following 2,000 users. Below this value, users can follow other users freely even though they would not have any followers.

At the lower end, the following is higher than the number of followers. This is typical for new and personal accounts. These are users who rather follow than want to be actively followed by others, or are in the process of building their network by first starting to follow others and hoping to increase their number of followers that way. In the high end, there is less variation in the follower-following relationship because of the Twitter policy. The hugely popular accounts with much more followers than following are located above the main line in the graph.

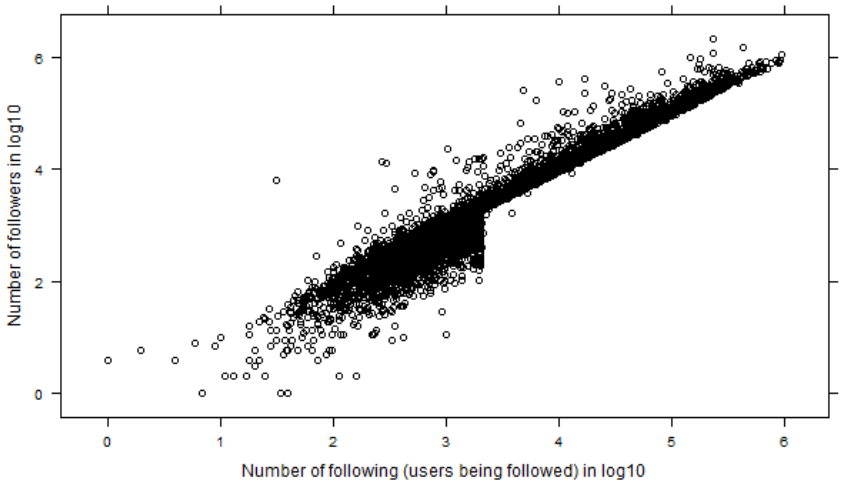

Fig. 3. Scatterplot of the number of following and followers, both values in log10 (e.g. log10(2000) = 3.3).

There were big differences between the case accounts as to how their followers were positioned in relation to this limit of following 2,000 users. 37% of the @funnyhatdudes followers, 55% of the @heavyshrimp followers, 40% of the @SelfieSec followers and 68% of the @KittenPrivacy followers were following fewer than 2,000 other users.

Retweeting and replying followers. The aim of the case accounts was to get followers who would be interested in testing the new apps. The API dataset does not include information about app downloads, but it tells about, which users retweeted case account tweets or replied to them. Retweeting and replying are important indications of interaction and interests, so we wanted to see what the main characteristics of these followers are, and if and how they differ from the average.

Table 7 shows the key figures relating to retweeting of and replying to case account tweets for the different accounts. The numbers of users who retweeted or replied to the brand account tweets were small, only about one percent of the followers of each account. When looking at the data, it is good to remember that our API dataset includes only the direct followers of the brand account. The real figures for retweets are higher, because retweeting spreads in networks and it is not only done by the direct followers.

Table 7. The numbers of unique case account tweets that were retweeted or replied to, the total numbers of retweets and replies and the numbers of unique direct followers, who retweeted or replied to the case account tweets.

		Retweets	Replies
@funnyhatdudes	Unique tweets that got retweeted or replied to (Internal dataset)	59 (24.4%)	36 (14.9%)
	Times retweeted/replied (Internal dataset)	117	41
	Unique retweeting of replying users (API dataset)	22 (1.1%)	16 (0.8%)

@heavyshrimp	Unique tweets that got retweeted or replied to (Internal dataset)	43 (33.6%)	36 (28.1%)
	Times retweeted/replied (Internal dataset)	64	43
	Unique retweeting of replying users (API dataset)	13 (0.5%)	14 (0.6%)
@SelfieSec	Unique tweets that got retweeted or replied to (Internal dataset)	88 (29.7%)	14 (4.7%)
	Times retweeted/replied (Internal dataset)	146	16
	Unique retweeting of replying users (API dataset)	14 (1.3%)	4 (0.4%)
@KittenPrivacy	Unique tweets that got retweeted or replied to (Internal dataset)	38 (71.7%)	20 (37.7%)
	Times retweeted/replied (Internal dataset)	609	34
	Unique retweeting of replying users (API dataset)	24 (1.0%)	23 (1.0%)

On average, the retweeting users had much less followers that the account followers as a whole (Table 8). The median numbers of followers were between 195 and 602 followers for the retweeting and replying users, when they were 1,020 and 6,128 for all the followers.

Table 8. The statistics of the numbers of followers for the users who had retweeted or replied to case account tweets.

	@funnyhat-dudes	@heavyshrimp	@SelfieSec	@Kitten-Privacy
Number of users	27	22	13	42
Min number of followers	4	4	1	49
Mean number of followers	497	2,869	2,738	967
Max number of followers	2,468	36,641	30,938	5,131
Median number of followers	195	514	199	602
Median number of followers for all the followers of the account	6,128	1,520	4,513	1,020

These users were retweeting more than all users in average, as can be seen in Table 9. Only 14% of the followers who had retweeted or replied to the case account tweets were following more than 2,000 other users, which is considerably less than the 43% of the whole dataset.

Table 9. Statistics of the retweet percentage for all users and those who had retweeted case account tweets.

	Min.	1st Quarter	Median	Mean	3rd Quarter	Max.
All users	0.0	17.4%	38.0%	41.0%	59.4%	98.3%
Those retweeting case account tweets	3.3%	36.8%	53.5%	52.7%	65.8%	98.3%

Figure 4 shows the difference in tweeting activity during the last 90 days of all the followers of the four case accounts and of those followers who had either retweeted the case account tweets or replied to them. The total user base is concentrated at the extreme ends of the activity scale: around 40% of the users tweeted at least 400 tweets during the last 90 days making it the biggest group followed as the second by those users who had tweeted 1-50 times during the last 90 days.

The users who had retweeted the case account tweets or replied to them, showed a somewhat different behavioural pattern: the biggest group was those who had tweeted 1-50 times and the second largest group was tweeting 51-100 times during the last 90 days. The most active group with 400 or more tweets in 90 days was the third largest.

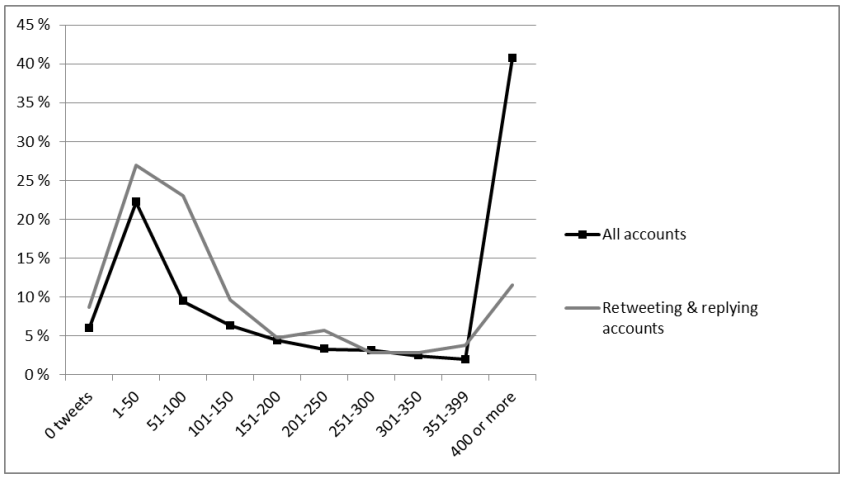

Fig. 4. The share of users in the different activity classes (tweets during the last 90 days) for all follower accounts and for those who retweeted case account tweets or replied to them.

When we summarise characteristics of the retweeting and replying users in comparison to all users in the dataset, we can see that the retweeting users tended to have a fairly low number of followers, most of them followed fewer than 2,000 accounts, they retweet fairly much in general, and their overall tweeting activity is not likely to be more than 100 tweets/90 days or about 1 tweet per day.

5 Discussion and conclusions

This paper analysed the potential of Twitter in acceleration of marketing of new products and using it in growth hacking. The huge number of users and the ease of

use make Twitter a potentially efficient channel for marketing new products and ideas, but using it for this purpose is not trivial, particularly for brands and products that are not widely known.

We chose Twitter as a channel, because of its potential for quick viral spreading of tweets, as well as, because it is quick and easy to set up an account there and the account does not necessary have to be linked to any real identity or company. Social media sites that mix interests and relationships could be very suitable for companies (Spaulding, 2010) and Twitter fills this criterion, but because of its size, unorganised structure and its special type of content (short texts, links and photos), locating the potential communities where interests and relationships are well combined, is not trivial.

To answer our research questions, we conducted a literature analysis and a case study of four Twitter accounts that had been set up for marketing two new applications downloadable at Google Play. The case study analysis was based on the experiences of the account owners and additional insights were sought by looking at the available data on tweet performance and follower characteristics.

Our first research question asked what the challenges in using Twitter as a tool for acceleration are. The key challenge is growing the number of followers with reasonable effort and to get such followers that are interested in the promoted app, or at least eager to spread awareness of the app by retweeting. It is impossible to know in advance who will be a useful follower; so many followers need to be accumulated. The intuition is that it is good to have followers that are being followed by many, but in practice, such users often also follow a huge number of accounts, which means that it is hard to get their attention or make them retweet one's tweets. Without retweeting there is no benefit of their huge networks. The experience of the account maintainers confirmed, that only few connections in Twitter are meaningful. Many user accounts have been created for getting attention to their own products or ideas, so they are not that potential as a target group. Getting followers, depends a lot on the topic and how it is presented: the @KittenPrivacy account got much more followers than the @SelfieSec account. Now that Twitter supports posting photos, the posts with photos draw, in many cases, much more attention than text based tweets, which gives an upper hand to topics that can be expressed with interesting photos.

The second challenge is to predict the retweeting behaviour and viral spread of the tweets. Our case study showed that users, who retweet a lot in general, were also more likely than non-retweeting users to retweet the case accounts tweets. The tweeting behaviour was polarised with two main groups: very active tweeters with more than four tweets every day and fairly passive users with less than one tweet every second day. Those users that retweeted our case account tweets were typically not the extremely active users. They were typically publishing not more than one tweet/day and also they had reasonable numbers of followers and following-fewer than 2,000. Unfortunately Twitter does not show directly information of users' retweeting activity or tweeting frequency, making it harder to spot users with favourable characteristics.

As the viral spread of tweets is not guaranteed and based on the experience, it is hard to guess in advance, which tweets will start to spread and the successes were something of a surprise to the account owners as well. To gain followers and make tweets spread, it is necessary to be very active by connecting to new users and generating new tweets. This all takes time and effort, so even though the direct use of Twitter does not cost anything, costs accrue from the work that is needed.

Third challenge is that as the platform is owned and managed by Twitter, who can define and change the rules as they see best. One such rule is the limit of 2,000 following, after which the account cannot start to follow new users unless it has

almost as many followers. The effect of this limit could be seen very well in the data depicting the numbers of followers and following. The opportunity to tweet with photos is another recent change that has taken place in Twitter and has a big impact on user behaviour and what gets noticed.

Our second research question asked, what lessons can be extracted from using Twitter as a tool for acceleration. As Twitter is a very quick-pace and even chaotic environment, the main lesson learnt is to be very active and try different things. Many factors and luck play a role in determining how much attention a tweet will get, so the main thing is to be active. Some guidelines can and should be given to employees based on what generally works well. If several people maintain one account, they must share common understanding of the aims of the account and its behavioural style. Our analysis confirmed the conclusion of Roberts and Candi (2014) that social networking sites are hard to use successfully to get feedback from users. The maintainers of our case accounts did not get any feedback or other input to app development from the followers in Twitter, so other channels are clearly needed. In software products, integrating feedback into the app is a well-functioning approach.

A limitation of this study is that the four analysed Twitter accounts had only been running less than a year and conclusions of their long-term success cannot yet be drawn. Also the direct connection between the Twitter activities and downloads is hard to measure conclusively, as the Twitter internal statistics only capture the direct, immediate impact. Second, we analysed only the numeric aspects of the followers' networks and tweeting activity. By analysing the actual content in the tweets, additional insights could have been gained of the account owners' motivations for their presence in Twitter and how valuable followers they are, either as potential users of the promoted software, or as retweeters sharing tweets further into their networks. The third limitation of this study is that the amount of samples was quite small to draw comprehensive conclusions of user behaviour in Twitter in general.

There are several directions for future research to better understand the user behaviour in Twitter and how to use it more efficiently for the acceleration of marketing apps. A research setting with data collection over a longer period of time from both Twitter and Google play and taking varying actions in Twitter to get attention and followers would give deeper insights of the efficient ways of growing the follower's network and making tweets spread more efficiently.

A larger sample of Twitter accounts and a more detailed analysis of how the follower networks develop over a longer period of time would help to confirm the results of this study. This should entail looking more closely at follower characteristics, such as tweeting frequency and retweeting behaviour and the structures of their networks. Also analysing the tweet contents would help understand the user behaviour and motivations and identify different types of user accounts.

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6. References

Al-Debei, M. M., El-Haddadeh, R., & Avison, D. (2008). Defining the business model in the new world of digital business. *In Proceedings of the Americas Conference on Information Systems (AMCIS). 2008*, 1-11.

Angels, S. (2014). *8 Simple Secrets to Twitter Marketing Success*. Retrieved October 24th, 2014 from the website of BusinessNewsDaily:

http://www.businessnewsdaily.com/6126-twitter-marketing-tips.html

Anon, (2015). *20 lean innovation tools that can make the innovation process more successful and enjoyable*. Retrieved April 13th, 2015 from the website of Implement Consulting Group:

http://implementconsultinggroup.com/media/290884/lean-innovation-tools.pdf.

Apilo, T., Fiegenbaum, I., Still, K., Jaring, P., Wallin, A., Komi, M., Suciu, G. (2015). *Current state of art and practice, industrial needs for methodologies*. ITEA Accelerate-project deliverable D1.1, 80 p.

Asur, S., & Huberman, B.A. (2010). Predicting the future with social media. *In the Proceedings of the 2010 IEEE/WIC/ACM International conference on Web Intelligence and Intelligent Agent Technology (WI-IAT 2010)*. August 30-September 3, 2010. Toronto, Ontario, Canada. pp. 492-499.

Biyani, G. (2013). *Explained: The actual difference between growth hacking and marketing*. Retrieved January 19th, 2015 from the website of TNW (thenextweb): http://thenextweb.com/insider/2013/05/05/the-actual-difference-between-growth-hacking-and-marketing-explained/

Blank, S. (2013) Why lean startup changes everything, *Harvard Business Review*. *91*(5), 63-72

Bodnar, K., & Cohen, J.L. (2011). *The B2B Social Media Book: Become a Marketing Superstar by Generating Leads with Blogging, Linkedin, Twitter, Facebook, Email, and More*. John Wiley & Sons, Inc. Hoboken, New Jersey.

Bruns, A., & Burgess, J. (2012) Researching news discussions on Twitter. New methodologies. *Journalism Studies*, *13*(5-6), 801-814.

Bucklin, R. E., & Sismeiro, C. (2009) Click here for Internet Insight: Advances in Clickstream Data Analysis in Marketing. *Journal of Interactive Marketing 23*(1), 35-48.

Bullas, J. (2012). *12 Keys to Success in Twitter*. Retrieved October 27th, 2014 from the jeffbullas.com website: http://www.jeffbullas.com/2012/06/10/12-keys-to-success-on-twitter/

Bulygo, Z. (2013). *Learn Growth Hacking: 35 Resources to Help You Become a Growth Hacker*. Retrieved February 19th, 2015 from the KISSmetrics website: https://blog.kissmetrics.com/learn-growth-hacking/

Cha, M., Haddadi, H., Benevenuto, F., & Gummadi, P. K. (2010). Measuring User Influence in Twitter: The Million Follower Fallacy. *In Proceedings of ICWSM,* 10(10-17), 30.

Datta, A. (2009). *IT Based Knowledge Capability and Commercialization of Innovations: Modelling the impacts on ambidexterity and absorptive capacity*. Retrieved September 17th, 2014 from Sprouts website:

http://sprouts.aisnet.org/761/1/IT_Based_Knowledge_Capability%5BBLIND%5D.pdf

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of management review, 14*(4), 532-550.

Engel, J. S. (2011). Accelerating corporate innovation: lessons from the venture capital model. *Research-Technology Management*, *54*(3), 36-43.

Fitzgerald, M. (2013). *How Digital Acceleration Teams Are Influencing Nestlé's 2,000 Brands*. Retrieved September 17th, 2014 from MIT Sloan Management Review website: http://sloanreview.mit.edu/article/testing-123/

Huberman, B. A., Romero, D. M., & Wu, F. (2008). *Social networks that matter: Twitter under the microscope*. Available at SSRN 1313405.

Jansen, B. J., Zhang, M., Sobel, K., & Chowdury, A. (2009). Twitter Power: Tweets as Electronic Word of Mouth. *Journal of the American Society for Information Science and Technology, 60*(11), 2169-2188.

Jussila, J., Huhtamäki, J., Kärkkäinen, H., & Still, K. (2013). *Information visualization of Twitter data for co-organizing conferences*. In Proceedings of the 17th International Academic MindTrek Conference. Tampere, Finland, October 1-4.

Kaplan, A.M., & Haenlein, M. (2011). Two hearts in three-quarter time: How to waltz the social media/viral marketing dance. *Business Horizons, 54*(3), 253-263.

Kietzmann, J.H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons, 54*(3), 241-251.

KPMG, (2014). *Accelerating Innovation-the power of crowd: Global Lessons in eHealth Implementation*. Retrieved September 17th, 2014 from the KPMG website:
https://www.kpmg.com/Global/en/IssuesAndInsights/ArticlesPublications/accelerating-innovation/Documents/ehealth-implementation-v1.pdf

Kwak, H., Lee, C., Park, H., & Moon, S. (2010). *What is Twitter, a social network or a news media*? In the Proceedings of the 19th International Conference on World Wide Web, pp. 591-600.

Li, Z., & Li, C. (2014). Twitter as a social actor: How consumers evaluate brands differently on Twitter based on relationship norms. *Computers in Human Behavior, 39*, 187-196.

Malhotra, A., Malhotra, C. K., & See, A. (2012). How to get your messages retweeted. *MIT Sloan Management Review*, *53*(2), 61-66.

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons, 52*(4), 357-365.

Mohout, O. (2014). *Growth hacking demystified*. Retrieved January 1st, 2015 from the Accelerate-project website:
http://www.accelerateproject.eu/pdf/Growth_Hacking_seminar.pdf

Osterwalder, A., Pigneur, Y., & Clark, T. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Jersey: Wiley-Blackwell.

Pantaleo, D., & Pal, N. (2008). *From Strategy to Execution-Turning Accelerated Global Change into Opportunity*. Berlin Heidelberg: Springer-Verlag.

Rayport, J. (1996). *The Virus of Marketing*. Retrieved December 1st, 2014 from the FAST Magazine website: http://www.fastcompany.com/27701/virus-marketing

Ries, E. (2009). *Minimum Viable Product: a guide*. Retrieved August 17th, 2015 from Startup Lessons Learnt website: http://www.startuplessonslearned.com/2009/08/minimum-viable-product-guide.html

Ries, E. (2011). *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Random House LLC.

Roberts, D. L., & Candi, M. (2014). Leveraging Social Network Sites in New Product Development: Opportunity or Hype? *Journal of Product Innovation*

Management, 31(S1), 105-117.

Robson, C. (2002). *Real World Research* (2nd edition). Oxford: Blackwell.

Rowan, D., (2014). *Growth Hacking: Hype or the holy grail for startups*. Retrieved February 19th, 2015 from Wired.co.uk website:

http://www.wired.co.uk/magazine/archive/2014/09/features/growth-hacking

Spaulding, T. J. (2010). How can virtual communities create value for business? *Electronic Commerce Research and Applications, 9*(1), 38-49.

Soboleva, A., & Burton, S. (2011). Interactive or reactive? Marketing with Twitter. *Journal of Consumer Marketing, 28*(7), 491-499.

Statistic Brain, (2014). *Twitter Statistics*. Retrieved August 18th, 2014 from the Statistic Brain website: http://www.statisticbrain.com/twitter-statistics/

Teece, D. J. (2010). Business models, business strategy and innovation. *Long Range Planning, 43*(2), 172-194.

Tsimonis, G., & Dimitriadis, S. (2014). Brand strategies in social media. *Marketing Intelligence & Planning, 32*(3), 328-344.

Twitter, (2014). *About Twitter*. Retrieved August 18th, 2014 from the Twitter website: https://about.twitter.com/company

Webb, N. J. (2011). *The Digital Innovation Playbook: Creating a Transformative Customer Experience*. John Wiley & Sons, Inc., Hoboken, New Jersey.

Wilson, R. D., (2010). Using clickstream data to enhance business-to-business web site performance. *Journal of Business & Industrial Marketing, 25*(3), 177-187.

Yin, R. K. (2003). *Case Study Research, Design and Methods* (3rd edition). Beverly Hills: Sage Publications.

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Co-creating a digital service for small business owners' finance management

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Abstract. This paper presents a small-scale qualitative study exploring the everyday finance management of small business owners. The study was conducted by carrying out contextual interviews, combining the approach of business and social sciences. Insights from five study cases were utilised in co-creating a novel digital service targeted to facilitate finance management in the areas identified as challenging or lacking suitable services. The benefits and challenges of the co-creation process are also discussed. The findings increase the current understanding and bring practical implications to the understudied area of co-creation of financial services. For example, the needs for integration of services and graphical presentation of financial data are not met with current service offering and should be supported better. Gamification and social aspects, as well as, the need for mobile use, are seen as interesting elements for future research.

Keywords. Co-creation, Service Development, Novel Digital Services, Financial Services.

1 Introduction

Currently, the majority of digital financial services are developed for the needs of big companies. The needs of small companies, however, are in many ways different. The development of new financial services would benefit from being speeded up and from the incorporation of innovative ideas, as well as, from a better understanding of customer needs. Although the trustworthiness and safety of financial services play a central role, we believe we must find new ways of accelerating current development to satisfy the needs of a larger group of companies and to ensure overall satisfaction towards digital financial services.

To answer today's challenges related to new product and the service development process related to speed, quality and innovativeness, companies have to admit that in many cases the best people are probably not working for them. Instead, companies should seek for new external knowledge outside as Chesbrough (2003) suggests. Prior evidence shows that one valuable source for gaining fresh ideas and increasing creativity is the customers. Instead of treating customers or potential customers as passive recipients, they can become a key part of the innovation processes (e.g. Alam, 2006; von Hippel, 2005; Piller, 2004).

A rising interest in customer involvement has emerged in financial service development (Cooper and Edgett, 1996). Although financial institutions have been found to be intensive users of customer knowledge (see Hollenstein, 2003), the mechanisms of success in customer involvement and co-creation are still not thoroughly understood. The utilisation of co-creation in service development remains a rather unexplored area in general (Greer and Lei, 2012), as well as in the context of financial services (De Smet et al., 2014), on which this study aims at shedding light.

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The research question for this study is twofold. Firstly, we want to increase the understanding of the daily needs and challenges of small business owners when managing their finances. To answer this part, we aim at understanding their daily life in a wider context, extending beyond the pure management of finances. This broadening is achieved by combining research practice from business approaches and social sciences. Secondly, we want to explore how the co-creation approach fits into the design of a financial service, the kinds of benefits that can be achieved, and the challenges that need to be overcome.

The following questions crystallise the aim of our research:

> *RQ1. What kinds of needs and challenges do small business owners experience in their everyday finance management?*
>
> *RQ2. What kinds of benefits and challenges are identified when co-creating a novel digital financial service?*

Since our focus was not only on gathering information on small business owners' needs concerning financial services, but on gaining a profound understanding of their everyday life and co-creating with them, we chose a qualitative approach, using interviews as a main data collecting method.

This paper is structured in the following way. In the second section we introduce relevant literature concerning new service development, co-creation of financial services and benefits and challenges related to co-creation. The third section introduces our research design. In the fourth section we discuss on our results, drawing conclusions in the fifth chapter which ends with considerations of future research.

2 Current understanding

2.1 Concept of co-creation in the new product and service development context

Understanding customer and market needs is one of the consistent themes in the earlier literature on innovation success and failure (Barcley, 1992; Hart et al., 1999; Tidd and Bessant, 2009). Utilising customers' or potential customers' creativity and innovation capability has a great deal of potential in new product development and service design. In recent years, the transformation in the customer's role has changed from being a passive object into an active participant, co-creator and innovator. An on-going shift of companies' mindsets from product-orientation towards service-orientation has also accelerated this transformation by positioning the customer experience at the centre of a business's purpose (Chesbrough, 2011).

In the business context, the co-creation approach-involving customers as an external resource for new product and service development-has been recognised in both theory and practice for at least four decades (e.g. Freeman, 1991; Leonard-Barton, 1995; Rothwell et al., 1974; von Hippel, 1988). In addition to open innovation literature that takes the user-centred view in new product and service development, there are many related concepts covering the same issue. Lead user literature by Eric von Hippel (1986, 2005) and other scholars has been among the pacesetters in suggesting that users can become a key part of the innovation process. Furthermore, the concept of (value) co-creation introduced by Prahalad and Ramaswamy (2000, 2004) stresses the empowerment of the customers, and sees them as active participants in companies' processes. The perspective is thus value creation for, by and with customers (Edvarsson et al., 2006). The same idea is embedded in the terms 'co-development' and 'co-design'. It can be argued that the concepts presented, namely open innovation, lead user literature and co-creation, approach the same phenomenon from

different perspectives (company, user and development).

The idea of co-creation is to involve customers in different phases and stages of the product or service development process (Edvarsson, 2006). In order to take a closer look at the co-creation process, Reichwald and Piller (2005) have defined different levels of customer involvement in new product development. On the first level, customers are considered as passive targets. On the second, companies ask customers more actively about new product features or product concepts, using surveys, web-based conjoint analysis and other means in order to obtain access to customer preferences and needs. Dialogue between customers and companies begins. On the third level, customers participate in the process by designing their own solutions on the user innovation platform and are considered to be equal partners of the organisation. In this study, we chose to use this model so as to illustrate our co-creation process, although in the service development context.

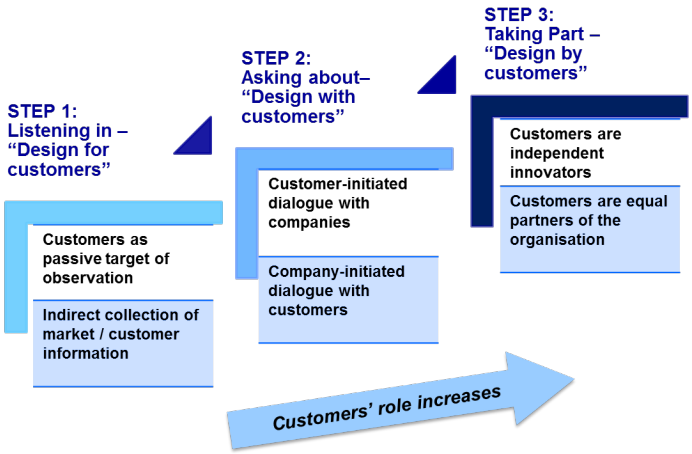

Fig. 1. Different levels of customer involvement in NPD process (modified from Reichwald and Piller, 2005).

2.2 Benefits and challenges related to co-creation

Co-creation with stakeholders is stated to provide companies with many benefits by enhancing the efficiency of the innovation process in terms of speed, costs and quality (Edvardsson et al., 2006; Hoyer et al., 2010). In a rapidly changing environment and with fiercer global competition, co-creation may benefit companies remarkably by reducing cycle time (Alam, 2006) and in this way accelerating the time from fuzzy-front-end to lauch, Also, one major benefit of customer interaction is the access to sticky information on user needs, user context and user experience, which is usually tacit and difficult to find (von Hippel and von Krogh, 2006; von Hippel 2005).

Overall, earlier studies indicate that co-creation enhances an understanding of customers' value (Magnusson, 2003), enhances customer relationships (e.g Gruen et al., 2005; McAlexander et al., 2002) and promotes long-term relationships (Alam, 2006). Customer involvement in NPD has also been shown to enhance product concept effectiveness (i.e. product-market fit), and may result in ideas for potential business opportunities (Alam, 2006; Brown and Eisenhardt, 1995; Bilgram et al., 2008; von Hippel, 1986). Heiskanen et al. (2007) argue that a more open-ended approach to concept testing is needed in order to encourage users to evaluate concepts more critically. Previous studies also suggest that involving users more in the

processes may also lower barriers to adopting new innovations (e.g. Alam, 2006; Rogers, 1983).

Despite the long list of the perceived benefits of co-creation, in many industries, customers have played-and continue to play-a limited and rather passive role in the development of new products and services. The most limiting factors have been poor connectivity with customers, possible lack of customer cooperation and an information gap existing between customers and producers (e.g. Alam, 2006; Franke and Piller, 2004). A natural reason for this is that companies face several challenges when trying to set up collaboration with customers. Furthermore, the risks of confidentiality and a lack of knowledge of how to interact with customers have influenced managers' willingness to involve customers in the process (Alam, 2006).

2.3 Co-creating financial services

Involving customers in service development process in the financial sector is indicated to include benefits, such as, improved quality of service and increasing speed of innovation (Carbonell et al., 2009; Chien and Chen, 2010). Oliveira and von Hippel (2011) emphasised the potential of customers as a source of innovation in the financial service development process. They found that as much as 55% of today's computerised commercial banking services in the US market are innovated, not by banks, but by individual users. In addition, 44% of corresponding computerised retail banking services were first developed and implemented by individual service users rather than by commercial financial service providers (Oliveira and von Hippel, 2011).

In the financing sector, the level of customer involvement varies considerably in the process, illustrated in Figure 1 (Chien and Chen, 2010). Opinion boxes and customer interviews are among the most common methods of customer interaction (Chien and Chen, 2010). Technological development and social media tools, however, open new methods for involving customers in co-creation (Antikainen 2011). Innovation tools may also be utilised when co-creating with potential future service users who are not yet customers of a company. For example, financial consumer services have been co-innovated, co-designed and evaluated with consumers using the VTT Open Web Lab (Owela), an online platform that enables consumers with various backgrounds to be reached for the purpose of co-creation in different phases of the design process (Heikkilä et al., 2011).

Although co-creation has been suggested to have several benefits, there are also controversial findings with regard to involving customers in new financial service development process. Some of the prior studies see customer involvement in a positive light (Drew, 1995; Menor and Roth, 2008), while others are more sceptical, especially of the degree of customers' interest and ability to contribute to novel financial service development process (Avlonitis et al., 2001; Vermeulen, 2004). Customers' *lack of confidence* (Howcroft et al., 2007) *and lack of knowledge* (Chien and Chen, 2010) concerning the providers of financial services have been seen as barriers for co-creation. However, these barriers could be alleviated by increased transparency towards customers, as well as, by customer education (Chien and Chen, 2010).

Apart from these challenges, it may be the case that the process with customers appears successful, but does not lead to explicit results. In one of the prior studies, customer involvement was found to have no direct effect on competitive superiority or sales performance (Carbonell et al., 2009).

To achieve the potential benefits of co-creation and overcome its probable barriers, one cannot underestimate the significance of careful planning of the co-creation process. Reaching the right participants, involving them in the suitable design phases

with appropriate methods and describing the design area or problem using their language, are all aims worth aspiring to.

3 Research design

3.1 Approach and methods

Our approach is qualitative and multidisciplinary, gathering holistic in-depth insights on small business owners' day-to-day finance management. Our field study combined the research perspectives of business and social sciences. First, by applying the social sciences approach we aimed at understanding the everyday financial tasks and practices of our study participants. While interviewing the participants, we also observed their key challenges in financial tasks and identified gaps between their needs and the current service offering. Second, we walked through the business models of our study cases, to ensure understanding of the ecosystem and the relevant issues for each case study. Based on this understanding, we identified the key challenges and needs that potentially could be tackled and met with a novel digital service. Case study research was selected as a study method, as its strengths lie in answering 'how' and 'why' questions and covering the context of the phenomenon under study (Yin, 2013; Baxter and Jack, 2008). These aspects are especially important in the realms of a research aiming at service development.

Our small-scale research consisted of five semi-structured contextual case-study interviews concentrating on everyday finance management and three feedback interviews focusing on the ideas and features of the service concept developed on the basis of the first interviews. The first interviews focused on the participants' current ways of managing finances, their needs and everyday challenges in creating opportunities for improved and novel design solutions. Feedback interviews introduced a new digital service concept for managing finances, let the participants interact with it and collected their impressions of the service.

The first interviews were conducted personally by two researchers at the participants' workplaces where the financial tasks are carried out. As the participants may have found it difficult to define their needs (see e.g. Avlonitis et al., 2001) and as concept development benefits from concrete material from the field, the contextual interviews were enriched with observation and demonstrations of the use of the participants' current financial services and tools. One of the researchers focused more on interviewing, the other one on writing down notes and photographing the current services, tools and parts of financial processes.

The second interviews were conducted by the same researchers either at the participant's workplace or by phone, according to the participant's preference. When carried out as a phone interview (selected by two participants), the service demonstration was shared with the participants both beforehand (sending them a link to the pilot service by e-mail) and during the session (using Skype). The service demonstration was not fully implemented, but covered the key aspects of the concept and illustrated its main features enabling user interaction.

3.2 Selecting the cases

The five cases were selected by purposeful sampling to represent different types of Finnish companies, to include both new and more experienced business owners and to show variation on the financial service needs. The cases include a gift shop, a baby equipment store, a used car dealership, an importer of a health product, and an IT service company. These show variation in terms of the type of sales (e.g. retail or online), their need for mobile tools and services (e.g. because of customer visits or

exhibitions) and their ambitions for growth. As the focus in the concept development was on small companies, only the business owner was interviewed (not all of them had employees). Three of the companies were located in the area of the Finnish capital Helsinki and two near Tampere, the largest inland city.

Table 1 lists background information of the cases.

Table 1. Background information of the cases.

	Case 1	**Case 2**	**Case 3**	**Case 4**	**Case 5**
Industry	Gifts and handicraft	Baby equipment	Used cars	Health products	IT services
Location	Near Tampere	Near Tampere	Near Helsinki	Helsinki	Helsinki
Founding year	2005	1993	2010	2012	2008
Number of employees	1	3	2	2014: 2 (2015:14)	2
Previous participation in co-creation projects	Yes	Yes	No	No	No

As financial matters are delicate and confidential by nature, the study cases were selected on the basis of previously built trust and confidence. Some of the business owners had already attended a co-creation project, while some were contacted by their bank adviser partnering in the project. This approach was mutually beneficial, leading to commitment from the participants while personally assuring them that the research would be worth attending. In contrast to some prior studies (see Howcroft et al., 2007 and Chien and Chen, 2010), the participants' lack of confidence or knowledge were not seen as barriers in this study, as the starting point for data gathering was our participants' expertise in their own financial tasks and everyday challenges.

3.3 Co-creation process

The co-creation process consisted of three phases. First, the study participants were interviewed and introduced to the idea of the development work. After the interviews, a pilot version of a new financial service was then designed, based on the findings of the field study. Third, the new service concept was introduced to the three business owners of the original five who were most dissatisfied with the current service offering. These three had an opportunity to give feedback on the concept and to re-design and co-create its structure and content further. Their feedback and ideas were brought to the designers for taking into account in the iterative design process. The first interviews were conducted in February and March 2014 and the feedback interviews in June 2014.

Co-creation with the business owners can be best mapped to Step 2 in the new product development process (see Figure 2): design and dialogue *with* the participants, not *for* them or *by* them. To be more specific, the research process also included the idea behind Step 1, listening to (potential) customers, as we did not only "ask about" desired services (as stated in the heading of step 2 in the figure), but also

observed the business owners using their current tools and services.

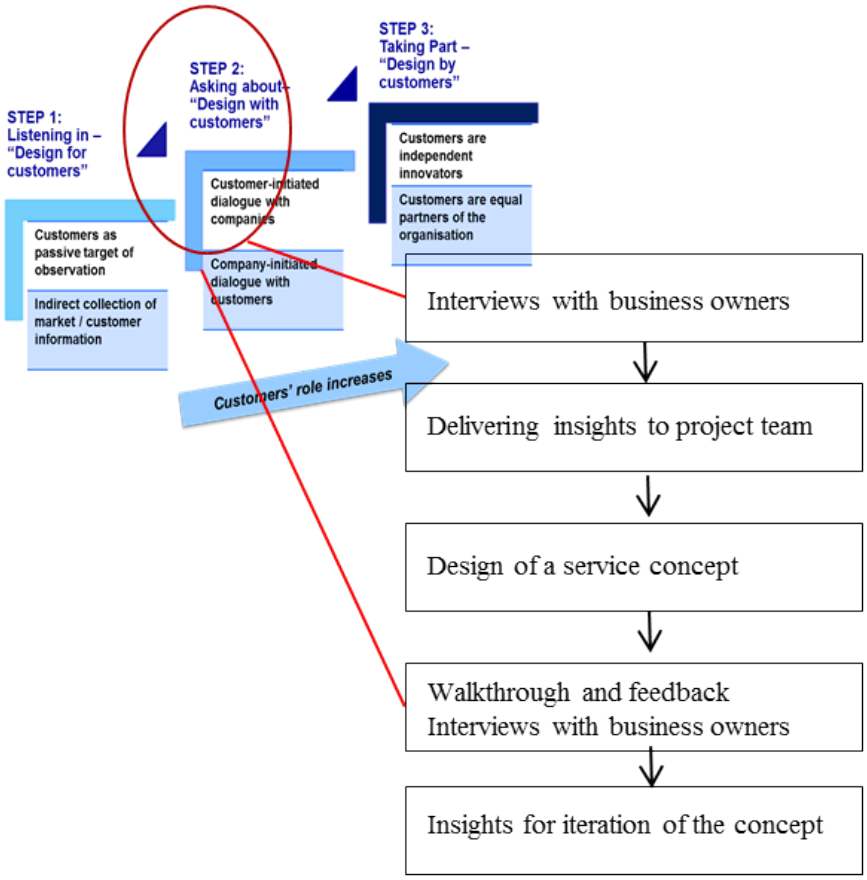

Fig. 2. Steps of co-creation process mapped to NPD process.

The co-creation approach was applied both when meeting the business owners and when bringing the findings to the project team, where parts of the concept were co-designed by domain experts, designers and researchers.

4 Results

4.1 RQ1: Everyday financial needs and challenges of small business owners

Our field study suggests that finance management is an area where novel digital services and the integration of existing services would be warmly welcomed. Our interviewees were lacking services that would feel as if they were targeted at small business owners and not at managing large businesses. Many of the current services were perceived to be *too complicated, too extensive or too expensive* for the needs of a small company. Small business owners would, thus, benefit from *an affordable modular system* that was simple enough to start with, yet allowed compatible parts to complement the service if needed later on.

Lacking suitably scaled, integrated services for their needs, the interviewees had created their own-often innovative-ways of combining services from different service providers: transferring information manually between them, using non-digital tools and even creating the missing parts of the services themselves. This gave us an exceptional opportunity to see the current gaps between services: the parts that required manual work and were thus likely to cause mistakes and the parts where the users decided to construct their own building blocks in order to gain the necessary data in the appropriate format. In spite of self-created solutions, however, lack of integration and compatibility between tools evoked frustration:

> *"This [finance management] is so primitive-without any decent digital system. I need to go through stacks of papers … It would be so much easier to find everything if the data was in one digital place." (Owner of a baby equipment store)*

One of the key challenges identified with the current financial services was *the lack of visual presentation* of the information. Among interviewees, the current services were perceived too colourless and number-based. Graphical data would not only be important for making use easier and more pleasant, but also for allowing a snapshot of the relevant financial changes or trends, for planning the future or following the past, or making comparisons based on the data. This would be a core area for development in terms of rapid pick-up of information and finding the essentials. All our interviewees would have appreciated either more graphical user interfaces or more illustrative data views. Comparison of the existing services to their work books, colour codes in their own archiving, or their self-created worksheets, revealed a huge difference in the use of colours. For example, one of our interviewees had created four different graphical presentations of his financial data, separating different income and outcome categories by using different colours. He followed his company's financial status mainly through these self-created graphs, as the ready-made tools did not offer sufficient visualisations.

Fig. 3. Examples of financial data visualisations created by an entrepreneur.

Users of manual work books also made use of colour as a means of retracing, categorising and planning financial tasks. One of the interviewees summarised her thoughts in a concrete way:

> *"Why couldn't this digital tool have some colours? They would be technically feasible and they wouldn't cost anything." (Owner of a gift shop)*

Even though the interviewees were not very experienced in mobile financial services, they emphasised *the need for checking and writing down notes related to finances also on the go*, They stressed that it would be useful to get the notes directly to an appropriate system, for instance writing an invoice of a customer visit right after it. Without a mobile service, transferring or archiving data requires manual work. However, the most important thing is that the tool in hand is instantaneous.

> *"Each move is documented somewhere, however small it is. Sometimes I have needed to write on a napkin." (Importer of a health product)*

In addition to our main goal of exploring the needs and challenges of our target group, we also discussed whether our interviewees would see social aspects or gamification elements as a potential part of future financial services. As their current services contained no social or game-like elements, the participants found these themes surprising. After a certain amount of pondering, most of the interviewees thought these elements could make use of the service easier or more engaging by supporting playfulness, or by lowering the threshold for asking help or advice from others. They qualified this by saying that use of these elements should not affect the credibility of the services or make them more complicated.

> *"Everything shouldn't be super serious. Adults need fun stuff, too."*
>
> (Owner of a gift shop)
>
> *"A good solution could also include additional services. As long as they weren't Angry Birds games, but something credible and reliable."*
>
> (Owner of an IT service company)

Social and gamification elements were seen to be most valuable for new business owners with less experience of finance management.

4.2 RQ2: Benefits and challenges of co-creation

Observing the everyday challenges and needs of small business owners furnished us with concrete guidelines for designing a new service. We wanted to facilitate the design of an integrated and holistic system providing sufficient-or even delightful-support in terms of visuality and customisability, with an affordable starting kit of appropriate simplicity. We delivered our findings and examples from the field to the project members, and the subsequent co-creation within the design group led to a service that connects fragmented financial applications into one dashboard. Introducing this AppCollection service to our interviewees allowed us to validate and further develop our findings from the field. Integration of the services and the graphical tools for planning future finances also proved to be the AppCollection service's most welcome features.

In general, the participants in the study were willing and interested in contributing to the service development-both in the first phase concentrating on their daily tasks and the second that introduced the new service concept. This may be due to several factors, such as perceived importance of the design mission, the clear focus of the participation phases and the possibility of participating with relatively low effort (no need for frequent meetings, the opportunity to meet at the workplace, the option of a phone interview for feedback). In our study, the lack of interest in financial offerings was not identified as a challenge (see Vermeulen, 2004), potentially due to the significance in business owners' everyday life of managing finances. Gaining the commitment of the participants through the first stage of the study also increased their interest in seeing the pilot version of the new service and in engaging in its co-creation.

When interviewing the business owners, we faced challenges related to the confidentiality of financial data and to the lack of user experience of mobile financial services. The issue of confidentiality was tackled by aiming at creating an atmosphere of trust and by offering flexibility in letting participants choose, which data they would show. Instead of focusing solely on mobile financial services, we widened our scope to discussion on mobile services in general and on portable manual tools related to managing personal finances. This gave us an opportunity to concentrate on the issues that participants felt were relevant and suitable.

Meeting the participants first at their workplaces was a crucial factor in our study, allowing them to share and to show the most essential work practices related to finance management. This helped us both in gaining concrete understanding of their daily tasks and in building trust between participants and researchers. However, based on our experience, the feedback interviews carried out by phone were as fruitful as a face-to-face feedback meeting, as we already had sufficient understanding of the participant's business and work practices.

Although existing literature includes scepticism about the willingness and ability of participants to contribute to the new service development (Avlonitis et al., 2001; Vermeulen, 2004), we see that willingness and ability are aspects that can be taken into account through careful recruitment and motivation for the study and by planning the mission of the co-creation phases and enabling greater participation for the participants most interested. These principles are easier to apply in qualitative research design; quantitative studies require more effort-and innovative research practices-in order to convey personal touch and recruit suitable persons.

5 Conclusions

5.1 Contribution to theory

Our study aimed at contributing to the discussion on co-creation and open innovation, as well as, to the field of new service development in the area of financial services. We wanted to gain understanding of the everyday challenges and needs of small business owners, who remain outside the main target group for service providers. The insights gained were used in our service design process, which we hope will lead to a new and successful service containing business potential and making a good match for the needs of small business owners.

The study enabled us to identify multiple needs for financial services, especially related to the possibilities of integration, scalability to small business owners' needs, and visualisations. The testing of a service concept brought valuable insights and offered an opportunity to validate the preliminary ideas with the targeted users of the service. We believe that the collaboration with small business owners in both phases, coupled with a deeper insight into their lives as business owners, resulted in a wider understanding of their preferences. At the same time, we gained an opportunity to explore the benefits and challenges of the co-creation approach and of methods related to the design of a financial service.

5.2 Practical implications

Collaboration between small business owners or potential future customers brought valuable insights on different phases of our service design process. For example, it revealed that the participants would need more integrated and compatible services and enhanced visual presentation of their financial data. These needs were used as principles for guiding the design process. Beyond focus on their daily tasks and current needs, the participants were also challenged by asking their views on including social or gamification elements in financial services. Although these aspects were not yet a part of the current services they used, they were not met with disapproval. On the contrary, participants saw their potential additional value, provided the design was not compromised by reduced credibility or greater complexity of service.

Based on the study, the following table summarizes the key features, which would make the finance management of small business owners more fluent and convenient. Especially the need for integration and visualisation of the data were emphasised, but

also other features were brought out by almost all interviewees.

Table 2. Desired features for small business owners' finance management.

Feature	Description
Integrated, holistic system	All financial management through one service
	Mobile version to be carried along
Modularity	New parts can be added easily
	No need to pay for unnecessary applications
Accounting in a right format	On paper or digitally-to avoid scanning, printing or similar manual tasks
Visuality	Supports comparing and picking up information
	Makes managing finances more pleasant
Customisability	Shows essential features, enables annotation and self-defined categorisation
Affordability	To start with a rather simple solution with less expenses
Instructiveness	Guides in finding efficient practices in using the tool and managing finances

Compared to traditional user research, the co-creation approach gave small business owners a more equal role in discovering their ways of working, innovating improved practices and sharing their everyday life as a business owner. The design could be based both on the needs identified by the researchers and the participants' own ideas for improving their current financial practices. Furthermore, combining the expertise of researchers, designers, domain experts and the actual target group widened the perspectives of all participants in the process.

5.3 Limitations and future research

As the research was small-scaled and qualitative, the results cannot be generalised as such. Also, the data concerning mobile use practices is limited due to the lack of existing mobile financial services. As mobile services are constantly increasing in variety and number, it would be interesting to study how the emerging services support the early adopters in their everyday financial practices.

We believe that both gamification and social aspects of the services have a more significant role in the future and would like to see the focus of research and development work extended to these elements. Although financial services might at first appear too serious and task-oriented an area for the inclusion of game-like elements or social interaction, our interviews indicate their additional value in this context too. As less obvious features, these might be core elements for differentiating an engaging service from the basic offering.

In general, co-creation and customer involvement remain a relatively underexplored area in the context of financial services (Akamavi, 2005), as well as for services in general (Greer and Lei, 2012). One direction for future research is thus to increase understanding of the involvement of customers and potential end-users in the different phases of new product and service development processes.

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designed and iteratively developed with a large Finnish IT service company (Tieto), a major Nordic bank (Nordea) and research institutes (VTT and Aalto University). We would like to thank our project partners, as well as, the business owners who voluntarily participated in this study and shared with us their valuable thoughts and experiences.

5 References

Alam, I. (2006). Process of customer interaction in new service development. In Edvardsson, B., Gustafsson, A., Kristensson, P., Magnusson, P., & Matthing, J. (Eds.), *Involving customers in new service development* (pp. 15-32). Series of Technology Management, 11. London: Imperial College Press.

Antikainen, M. (2011). *Facilitating customer involvement in collaborative online innovation communities*. Academic dissertation. Espoo: VTT Publications 760.

Avlonitis, G. J., Papastathopoulou, P. G., & Gounaris, S. P. (2001). An empirically-based typology of product innovativeness for new financial services: Success and failure scenarios. *Journal of Product Innovation Management, 18*(5), 324-342.

Barcley, I. (1992). The new product process: past evidence and future practical application. Part 1. *R&D Management, 22*(3), 255-264.

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, *13*(4), 544-559.

Carbonell, P., Rodríguez-Escudero, A. I., & Pujari, D. (2009). Customer involvement in new service development: An examination of antecedents and outcomes, *Journal of Product Innovation Management, 26*(5), 536-550.

Chesbrough, H. (2003). *Open innovation: the new imperative for creating and profiting from technology*. Boston: Harvard Business School Press.

Chesbrough, H. (2011). *Open services innovation. Rethinking your business to grow and compete in a new era*. USA: Jossey-Bass.

Chien, S. H., & Chen, J. J. (2010). Supplier involvement and customer involvement effect on new product development success in the financial service industry. *Service Industries Journal*, *30*(2), 185-201.

Cooper, R. G., & Edgett, S. J. (1996). Critical success factors for new financial services, *Marketing Management, 5*(3), 26-37.

De Smet, D., Mention, A., & Torkkeli, M. (2014). Involving High Net Worth Individuals (HNWI) for financial services innovation. *In Proceedings of The XXV ISPIM Conference-Innovation for Sustainable Economy & Society*. Dublin, Ireland, 8-11 June.

DIGILE (2014). http://www.digital-services.fi/.

Drew, S. W. (1995). Accelerating innovation in financial services. *Long Range Planning*, *28*(4), 1-21.

Edvardsson, B., Gustafsson, A., Kristensson, P., Magnusson, P., & Matthing, J. (eds.) (2006). Involving customers in new service development, Series of Technology Management, 11. London: Imperial College Press

Franke, N., & Piller, F. (2004). Toolkits for user innovation and design: an exploration of user interaction and value creation. *Journal of Product Innovation Management, 21*(6), 401-415.

Freeman, C. (1991). Networks of innovators: a synthesis of research issues. *Research Policy*, *20*(5), 499-514.

Greer, C. R., & Lei, D. (2012). Collaborative innovation with customers: A review of the literature and suggestions for future research. *International Journal of Management Reviews*, *14*(1), 63-84.

Hart, S., Tzokas, N., & Saren, M. (1999). The effectiveness of market information in enhancing new product success rates. *European Journal of Innovation Management, 2*(1), 20-35.

Heikkilä, P., Järventie-Ahonen, H., & Riihiaho, S. (2013). User Originated Innovation of Mobile Financial Services. In A. Marcus (Ed.), *Lecture Notes in Computer Science: Design, User Experience, and Usability. Web, Mobile, and Product Design* (pp. 660-665). Berlin Heidelberg: Springer.

Hollenstein, H. (2003). Innovation modes in the swiss service sector: A cluster analysis based on firm-level data. *Research Policy, 32*(5), 845-863.

Howcroft, B., Hamilton, R., & Hewer, P. (2007). Customer involvement and interaction in retail banking: An examination of risk and confidence in the purchase of financial products. *Journal of Services Marketing, 21*(7), 481-491.

Hoyer, W. D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. S. (2010). Consumer co-creation in new product development. *Journal of Service Research*, *13*(3), 283-296.

Leonard-Barton, D. (1995), *Wellsprings of knowledge*. Boston: Harvard Business School Press.

Magnusson, P. R. (2003). Benefits of involving users in service innovation. *European Journal of Innovation Management*, *6*(4), 228-238.

Menor, L. J., & Roth, A. V. (2008). New service development competence and performance: an empirical investigation in retail banking. *Production and Operations Management*, *17*(3), 267-284.

Oliveira, P., & von Hippel, E. (2011). Users as service innovators: The case of banking services. *Research Policy*, *40*(6), 806-818.

Piller, F. (2004). Mass customization: reflections on the state of the concept. *International Journal of Flexible Manufacturing Systems*, 16(4), 313-334.

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: the next practice in value creation. *Journal of Interactive Marketing*, *18*(3), 5-14.

Prahalad, C. K., & Ramaswamy, V. (2000). Co-opting Customer Competence. Harvard Business Review, *78*(1), 79-90.

Reichwald, R., & Piller, F. (2005). *Open Innovation: Kunden als Partner im Innovationsprozess*, München. Available online at http://www.impulse.de/downloads/open_innovation.pdf. 17.11.2010 [Last accessed: August 11th, 2015].

Rothwell, R., Freeman, C., & Townsend, J. (1974). SAPPHO updated: Project SAPPHO, Phase II. *Research Policy, 3*(3), 258-291.

Tidd, J., & Bessant, J. (2009). *Managing Innovation: Integrating technological Market and Organizational Change*. 4th edition, UK: John Wiley & Sons,.

von Hippel, E. (1986). Lead users: a source of novel product concepts. *Management Science*, *32*(7), 791-805.

von Hippel, E. (1988). *The Sources of Innovation*. New York: Oxford University Press.

von Hippel, E. (2005). *Democratizing innovation*. Cambridge: The MIT Press.

Vermeulen, P. (2004). Managing product innovation in financial services firms. *European Management Journal*, *22*(1), 43-50.

Yin, R. K. (2013). *Case study research: Design and methods*. Beverly Hills: Sage Publications.

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Wisdom-of-the-crowds to enhance innovation: state of the art

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Abstract. Our paper performs a systematic literature review on academic and non-academic studies on "wisdom of the crowds" or "collective intelligence" and its possible usage to enhance innovation, with or without financial compensation for the member of the crowd. We aggregate and critically compare contributions since 2004, when the concept was coined, in a conceptual framework meant to assist innovation professionals in sourcing various types of knowledge from the crowds. Key dimensions point towards different approaches according to the type of information/knowledge required, different types of target-crowd, according to company goals and phase of innovation process where knowledge is to be used.

Keywords. Costumer, Consumer Behavior, Consumer Information, Consumer Co-creation, Online Community, Wisdom of Crowds, Crowdsourcing, Collaboration, Social Computing, Information Medium, Knowledge Management.

1 Introduction

In the last decade, organizations have increasingly looked into knowledge sourcing, preferably for free, from online communities e.g. social networks, discussion groups and blogs (Brabham, 2012; Haythornthwaite, 2009; Kang and Kang, 2010; Saur-Amaral and Amaral, 2010; Saur-Amaral and Rego, 2010; Tödtling et al., 2011; Yue and Blevis, 2011).

There are still debates on the potential value of the knowledge obtained using this means and whether it should be used in the innovation process (Baumoel et al., 2009; Buggie, 2007; Ebner et al., 2008; Nishida, 2011; Saur-Amaral and Rego, 2010) and we find different types of crowds act in different ways for different purposes (Brabham, 2012; Buggie, 2007; Hill and Ready-Campbell, 2011; Wagner et al., 2010; Welinder et al., 2010).

The main goal of our study is the development of a conceptual model showing how can the wisdom of the crowds be used to enhance organizational innovation, at what level of the organizational innovation (process, project, product/service and overall strategy) and according to what type of knowledge. We build a framework that can be used to strategically map the possible alternatives and to draw operational schemes to implement crowdsourcing initiatives.

To build the conceptual model, we perform a systematic literature review around the concept of crowdsourcing for innovation (Ebner et al., 2008; Saur-Amaral and Rego, 2010), using published scientific work to look back into the past, and discussion/opinion scientific and non-scientific work to look into the future. We draw our data from four databases: Google Scholar, ISI Current Contents, Scopus and ABI inform.

We critically compare and aggregate existing contributions from scientific journals, proceedings, opinion journals and discussion papers, between 2004 to April 2012, to

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create a knowledge base on collective intelligence/"wisdom of the crowds" usage for innovation, a framework to assist innovation professionals and scholars interested in further studying the concept. This framework is developed using content analysis of abstracts and a selection of full-texts and supported by plain bibliometric analysis of key publications and authors.

Our paper starts with the methodology chapter, where we plan the systematic literature review in all its dimensions. Next, we present a synthetic view of expected scientific knowledge on the topic and develop the review protocol. After that, we present the data collection and results. We subsequently develop the conceptual framework and support it with explanatory description of key dimensions and respective citations, to allow its application in further studies.

2 Methodology

The achievement of our research goal requires searching, filtering and analyzing a large number of publications related to wisdom of crowds and its role in organizational innovation. This is a research task to be performed in the methodological underpinning of literature reviews and conceptual model building.

In the latest decade, there has been quite a large number of academic studies focusing on meta-analyses, systematic literature reviews, structured literature reviews and so on (Briner and Denyer, 2012; Crossan and Apaydin, 2010; Denyer and Tranfield, 2009; Kofinas and Saur-Amaral, 2008; Pittaway and Cope, 2007; Saur-Amaral and Amaral, 2010; Walker, 2010).

However, researchers tend to use informal and unstructured processes to review literatures and decide upon the key areas to research (Tranfield et al., 2003, see Table 1, page 213, for a very detailed perspective over the process), which necessarily leads to an incomplete process of identification of scientific school of thought and to low efficiency in the research process (Kofinas and Saur-Amaral, 2008; Saur-Amaral, 2010; Saur-Amaral, 2011). Systematic literature reviews are a systematic approach, with specific methodological concerns, which allow us to overcome this limitation.

In social sciences, the first adaptation of systematic literature reviews was done in 2002 and 2003 (Tranfield et al., 2003; Tranfield and Mouchel, 2002). Tranfield and his colleagues proposed that systematic reviews should be used to develop decision-making evidence databases for managers, so as to overcome the typical unsystematic, informal and unconditioned process of literature review and to identify key areas to research. They suggested the methodological approach presented in Table 1.

Table 1. How to perform a systematic literature review (synthesis of approach suggested by Tranfield et al., 2003).

Steps	Methodological concerns
Planning the review: • **Why do a review?** • **Prepare review proposal** • **Develop a review protocol**	May require previous studies to better understand the field and identify alternative ways on how the topic has been previously addressed The review protocol should contain a conceptual discussion of research problem. Keywords and search terms should be identified.
Conducting the review: • **Identify research** • **Select studies** • **Assess their quality**	Should be a comprehensive, unbiased search, rigorously applying the review protocol and the inclusion/exclusion criteria. Search should be reported in sufficient detail to ensure replicability.

• **Extract data** • **Synthesize data**	Disagreement between reviewers should be explained and consensus should be reached. The output of the search should be the full list of relevant results.
Reporting and dissemination: • **Developing the report** • **Dissemination into practice**	Should be clear and effective. Two types of reports can be produced: descriptive analysis of all results (most relevant authors, journals etc.) and thematic analysis (emergent themes and research questions)

In our research, we apply the three steps of the systematic literature reviews, considering the experience of previous studies (Briner and Denyer, 2012; Crossan and Apaydin, 2010; Denyer and Tranfield, 2009; Kofinas and Saur-Amaral, 2008; Saur-Amaral and Amaral, 2010; Walker, 2010).

We first study the concept and then build the review protocol, based on keywords, previously used by other authors. We rigorously perform the search according to the review protocol and we record all the steps and justify decisions, ensuring transparency and replicability of the study. We extract records to Endnote X5, where we perform the preliminary relevance selection and we export relevant records to xml and then import into NVivo 9.

We perform content analysis in NVivo, using as orientation framework the keywords and the previous knowledge on the concept, yet drawing on categories building in a grounded-theory approach (Charmaz, 2006), following the three coding phases. We use coding queries and cluster diagrams to explore and test results and we extract information via reports and specific matrix-coding queries, to support categories with specific number of references and citations. Descriptive data for generic and thematic statistical analysis is drawn from the classification sheet and imported in SPSS.

The conceptual model is built upon the data obtained from content analysis and explanatory description of each component is supported by citations and references obtained from NVivo analysis.

3 Wisdom of Crowds, Crowdsourcing and Innovation

3.1 What Is Wisdom of Crowds?

James Surowiecki (2005) coined the term "wisdom of crowds" to refer to the frequent superiority of groups over individuals in predicting public opinion:

> "individual irrational acts […] can produce collectively rational outcomes" (Surowiecki, 2005, p. 116)
>
> "experiments showed that […] even imperfect markets populated by imperfect people could still produce near ideal results "(Surowiecki, 2005, p. 103)

While this is part of a philosophical debate (Solomon, 2006), several studies have proven that group judgment and group decision has tendencially proven superior to individual judgment and decision, as individuals adhere and are influenced by their group (Buggie, 2007; Duboff, 2007; Ebner et al., 2008; Herzog and Hertwig, 2011; Hill and Ready-Campbell, 2011; Kittur and Kraut, 2008; Kozinets et al., 2008; Lopez et al., 2009; Mayo-Wilson et al., 2010; Ray, 2006).

Public opinion polls have been used by politicians to predict events, crowds of financial experts have been used to develop prediction markets able to estimate e.g.

evolution of future markets (Hill and Ready-Campbell, 2011; Ray, 2006)

3.2 How Do We Source Crowds?

The crowdsourcing concept is recent and emerges from practice. Howe (2006) introduces this concept as a way of using the crowd (people in general, unlinked to any specific organization and unrelated to any organizational hierarchy) as a content/knowledge producer. Several authors relate crowdsourcing to web 2.0 potential to obtain contributions from lots of people on a given issue (Bonabeau, 2009; Hudson-Smith et al., 2009; Leimeister et al., 2009; Vojnovic and Dipalantino, 2010; Vukovic, 2009).

We define crowdsourcing as a set of methods/techniques typically supported by web-based technologies, used to obtain low-cost external contributions (i.e. source external knowledge) potentially useful for an organization, from a large number of individuals. This is the operational definition we assume in our paper.

There are four types of crowdsourcing activities:

- Crowd wisdom (CW) – using knowledge and information outside the organization to help with decision-making, predict markets or perform specific tasks (Dahlander and Magnusson, 2008; Howe, 2008; Jouret, 2009; Leimeister et al., 2009; Thayer, 2001; Thayer, 2006)
- Crowd creation (CC) – generating content and valuing it (Almeida et al., 2010; Bernoff and Li, 2008; Buckley and Giannakopoulos, 2010; Han, 2010; Howe, 2008; Huberman et al., 2009; Kho, 2006)
- Crowd voting (CV) – filtering and ranking online content (Howe, 2008; Liu et al., 2008; Park and Pennock, 2007)
- Crowd funding (CF) – capacity of the crowd to finance specific activities or a specific project (Howe, 2008; Kiva, 2011; Levenshus, 2010; Lipton, 2009).

Sourcing crowds has been approached differently, whether applied in offline, or online media. The most known technique to source the wisdom of the crowd in offline environment is Delphi (Buggie, 2007; Duboff, 2007), used to define future scenarios and draw technological roadmaps, i.e. used for medium-and long-term forecasting.

In online media, academic studies have focused on crowdsourcing and open source initiatives, considered to be related to organizational innovation processes (Ebner et al., 2008; Muhdi et al., 2010; Saur-Amaral and Rego, 2010). Crowdcreation has been used in open or closed wiki spaces or online game platforms (like Second Life some years ago) to identify directions of new product development and help customizing new products.

Online Crowdsourcing (which is the focus of our paper) is usually supported by Internet-based technological platforms (Cummings et al., 2010; Muhdi et al., 2010; Santonen and Lehtelä, 2010; Saur-Amaral and Rego, 2010), yet the usage of social networks as technological platforms for crowdsourcing is still in its infancy (Saur-Amaral and Rego, 2010).

3.3 What is the Link between Crowdsourcing and Innovation?

Crowdsourcing is only one of different techniques used to source external knowledge for innovation and it may be limited to the type of knowledge it can obtain.

As Kang and Kang (2010) argue, if based on social networks, it has low cost, but has as disadvantage a "relatively invaluable knowledge transfer", as it is focused on information sharing and not on "critical capability sharing" (Granovetter, 1973; Hansen, 1999, cit. in Kang and Kang, 2010, page 5).

More recent studies argue that there is capability sharing in social networks, due to the development of shared empathy spaces in online networks where professionals share critical knowledge as part of a community of practice (Saur-Amaral et al., 2011; Saur-Amaral and Rego, 2010).

Few usages of crowdsourcing for R&D or innovation in organizations have already been pointed by literature: solving concrete issues in the R&D/innovation processes and helping R&D/innovation managers to better integrate information/knowledge (Becker, 2011; Bonabeau, 2009; Cummings et al., 2010; Howe, 2006; Howe, 2008; Hudson-Smith et al., 2009; Leimeister et al., 2009; Santonen and Lehtelä, 2010; Saur-Amaral and Rego, 2010; Vojnovic and Dipalantino, 2010; Vukovic, 2009) – see Table 2.

We use this knowledge as a starting point for our systematic literature review, in the next section.

Table 2. Main benefits of crowdsourcing for R&D/innovation managers.

Focus	*Benefit*	*Reference*	*Crowdsourcing Type*
R&D	Problem identification	(Cummings et al., 2010)	CW, CC, CV
	Idea generation	(Muhdi et al., 2010 ; Santonen and Lehtelä, 2010)	CC
	Idea debate/development	(Saur-Amaral and Rego, 2010)	CW, CC
	Personalized interaction with and feedback from users	(Whitla, 2009)	CW, CC, CV
	Problem-solving	(Saur-Amaral and Rego, 2010)	CW
	Integration of disperse knowledge (better knowledge brokers and project managers)	(Becker, 2011)	CW, CC
MARKET / STRATEGY	Future scenario development	(Saur-Amaral and Rego, 2010)	CC, CW
	Opening markets and creating new market share	(Whitla, 2009)	N/A
	Advertising and promotion activities	(Whitla, 2009)	N/A

4 Systematic Literature Review: Crowdsourcing for innovation

4.1 Planning and Data Collection

We first filled in the review protocol (see Appendix). Next, we collected data, independently in each database, and results as shown in Table 3 and the final list of results imported in Endnote had 37 papers.

Table 3. Overview of data collection in the three databases and Google Scholar.

Database	*Number of results*	*Citations*	*Duplicates*
ISI Current Contents	6	(Bogers and West, 2012; Ebner et al., 2009a; Hutter et al., 2011; Jashapara, 2007; Nam, 2012; Reissberg, 2011a)	Ebner et al., 2009; Nam, 2012;, Reissberg, 2011
Scopus	8	(Brabham, 2008; Chanal and Caron-Fasan, 2010; Ebner et al., 2009c; Nam, 2012; Reissberg, 2011a; Saur-Amaral and Rego, 2010; Schweisfurth et al., 2011a; Wexler, 2011b)	Ebner et al., 2009; Nam, 2012; Reissberg, 2011; Schweisfurth et al., 2011; Wexler, 2011
ABI Inform	7	(Datta, 2008; Ebner et al., 2009b; Hempel, 2006; Potter, 2010; Reissberg, 2011b; Schweisfurth et al., 2011b; Wexler, 2011a)	Ebner et al., 2009; Reissberg, 2011; Schweisfurth et al., 2011; Wexler, 2011
Google Scholar	23 (first five pages)	(Antikainen et al., 2010; Albors et al., 2008; Andersson, 2009; Battistella and Nonino, 2012; Bayus, 2013; Bonabeau, 2009; Elmquist et al., 2009; Enkel et al., 2009; Ghafele and Gibert, 2011; Haller et al., 2011; Huberman et al., 2009; İren and Bilgen, 2012; Leimeister, 2010; Leimeister et al., 2009; Littlejohn et al., 2012; Luo et al., 2009; Malone, 2008; Malone et al., 2009; Riedl et al., 2010; Schaffers et al., 2011; Schenk and Guittard, 2009; Tzeng, 2009; Yang, 2012)	n.a.
All no duplicates	37	(Antikainen et al., 2010; Albors et al., 2008; Andersson, 2009; Battistella and Nonino, 2012; Bayus, 2013; Bogers and West, 2012; Bonabeau, 2009; Brabham, 2008; Chanal and Caron-Fasan, 2010; Datta, 2008; Ebner et al., 2009c; Elmquist et al., 2009; Enkel et al., 2009; Ghafele and Gibert, 2011; Haller et al., 2011; Hempel, 2006; Huberman et al., 2009; Hutter et al., 2011; İren and Bilgen, 2012; Jashapara, 2007; Leimeister, 2010; Leimeister et al., 2009; Littlejohn et al., 2012; Luo et al., 2009; Malone, 2008; Malone et al., 2009; Nam, 2012; Potter, 2010; Reissberg, 2011a; Riedl et al., 2010; Saur-Amaral and Rego, 2010; Schaffers et al., 2011; Schenk and Guittard, 2009; Schweisfurth et al., 2011a; Tzeng, 2009; Wexler, 2011b; Yang, 2012)	n.a.

Source: author compilation

After successful importation and elimination of duplicates, we performed a relevance selection, based on abstracts, for those results that came from the three scientific-

oriented databases (ISI Current Contents, Scopus and ABI Inform). All records had abstracts in English and a brief analysis proved them to be potentially useful for the research.

For all these records, as well as, records obtained from Google Scholar, we went to obtain Full Text. Out of all records, for two of them we could not obtain full text (Malone, 2008; Schweisfurth et al., 2011a). (Malone, 2008) was eliminated from the results, as it came from Google Scholar and had no abstract, so we could not analyze it in the thematic analysis. We kept (Schweisfurth et al., 2011), which had a relevant abstract obtained from Scopus and ABI Inform.

Our list of results went thus down to 36 results, out of which 35 with abstract and full text, and 1 with abstract only. Next, we created the xml file for importation in NVivo, where all 36 results were imported.

4.2 Results: Descriptive statistics and Thematic Analysis

We first filled in the review protocol (see Appendix 1). Next, we collected data, independently in each database, and results as shown in Table 3 and the final list of results imported in Endnote had 36 papers.

We performed descriptive statistics on authors, publication years and publication names. From a total of 78 authors and co-authors, only two authors had more than one publication:

- Jan Marco Leimeister, 3 papers;
- Helmut Krcmar, 2 papers

In terms of publication years, as it can be observed in Figure 1, there has been an increase in 2009, however decreasing in the late years.

While the number in 2012 is apparently low, we need to take into account that the data collection was performed in May 2012 and also that it is higher than 2008. Nonetheless, 2009, with 11 publications, is the most represented in our sample (30%).

Regarding publications, there is no particular leader, from all 22 scientific publications, only three of them published more than one paper:

- Business & Information Systems Engineering (2 papers)
- International Journal of Technology Intelligence and Planning (2 papers)
- R and D Management (2 papers)

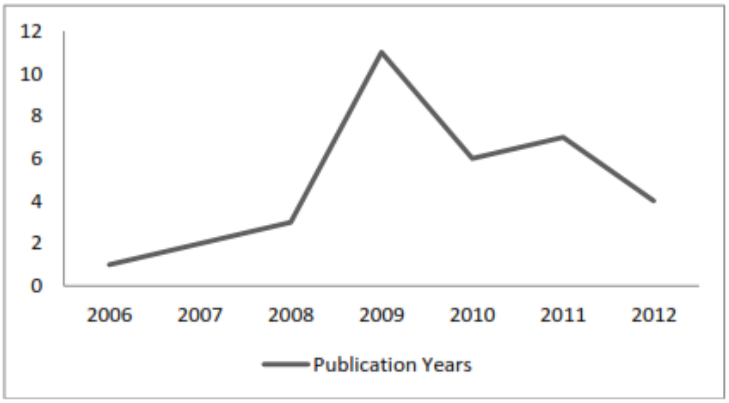

Fig. 1. Yearly distribution of publications in our sample.

Regarding publications origin i.e. if they came from ISI, Proquest, Scopus or Google Scholar, we can see in Figure 2 that 17% of our sample comes from ISI Journals (A to C) and a large majority (63%) comes from Google Scholar and is not included in any other scientific-oriented database.

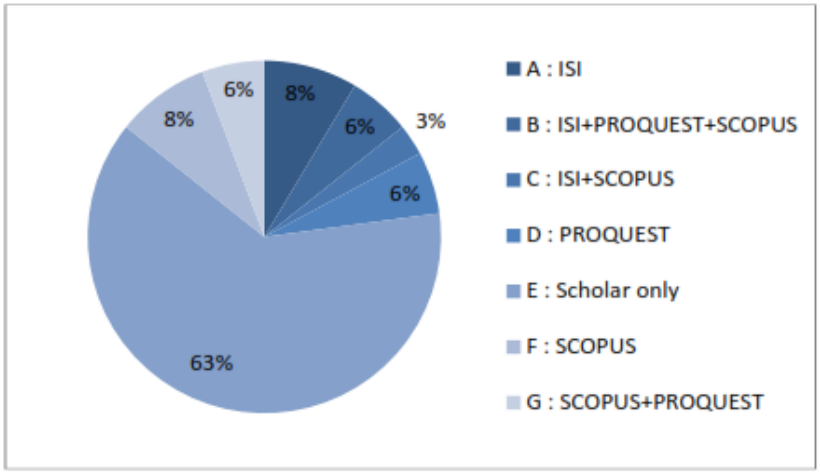

Fig. 2. Distribution of publications per origin.

Before coding manually all full texts, we looked at word frequency in keywords and abstract (Figure 3).

Fig. 3. Word Frequency Maps (Tag Clouds) for Keywords (LEFT) and Abstracts (RIGHT) in Our Sample.

We can see that the most frequent words are innovation, knowledge, communities and collective, followed by business, open and social.

The abstracts give more emphasis to models, research and processes, together with crowd(s) and research, while keywords emphasize more words like virtual, software and source, together with information and networks.

The manual coding complemented this perspective.

A first overlook to the main research questions (see Table 4) linked to crowdsourcing

revealed that most questions were exploratory, trying to comprehend the motivations of crowdsourcees to collaborate in crowdsourcing initiatives, the structure and management of different type of communities for crowdsourcing, as well as trying to look at crowdsourcing from an organizational strategic perspective, developing goals and appropriate implementation tools and management practices and debating intellectual properties issues.

Table 4. Sample of Research Questions on Crowdsourcing.

Research question	*Authors*
"How can users be motivated to collaborate in OI communities? What kind of tools and methods can support collaboration in OI communities?"	(Antikainen et al., 2010, page 100)
What is "the nature of an individual's ideation efforts in a crowdsourcing community over time"? Do "ideators with past success in proposing ideas that are implemented continue to generate the types of ideas an organization desires to implement?"	(Bayus, 2010, page 227)
"What are the main strategic difficulties encountered by firms whose business models rely on public web communities to create value?"	(Chanal et al., 2010, page 318)
"How to find and lever the enormous potential of the 'collective brain' to broaden the scope of 'open R&D'?"	(Ebner et al., 2009, page 1)
"Examine the manner in which advocates of crowdsourcing reconfigure the classical sociological treatment of the crowd"	(Wexler, 2011, page 6)

Methodological approaches naturally follow the exploratory nature of the research questions, focusing on case-based reasoning and panel data analysis for specific communities designed for crowdsourcing.

The most frequent cases mentioned as examples or used as object of study go around classical Innocentive, IdeaStorm, Threadless, iStockphoto, NineSigma, Yet2Com,Goldcorp, yet less famous names appeared, too (e.g. Crowdspirit, SAPiens, Innovation Jam, Syntegration, innerTee, Bookmooch). However, new platforms continue to emerge, thus names may lose popularity after a while, what is important is the concept, the way of interaction with the crowd and crowdsourcee-to-crowdsourcee and the way it is managed.

Crowds are different. Specialist crowds with little interaction are different than generalist crowds with lot of interaction and collective intelligence concept applies differently in those types of crowds. Bonabeau (2009, page 51) has an interesting table arguing towards this idea.

Therefore, the expected contributions in the case of crowdsourcing in these crowds are also expected to be different (e.g. idea sourcing from generalist crowds may be used to discover different concepts or identify problems that need to be solved, while idea sourcing from specialist crowds may be used for problem solving or for the development of technical solutions of technical feedback during the process).

Therefore, appropriate toolkits to tap into community/collective knowledge/wisdom may also be different (Antikainen et al., 2010).

A large number of publications look into motivations of participants in crowdsourcing initiatives, in free or paid contributions environment. Figure 4 presents the key motivations encountered during coding.

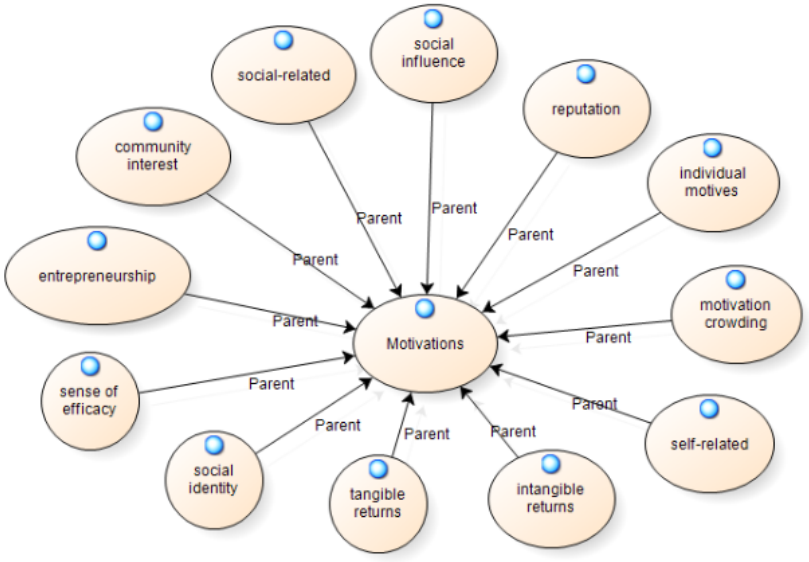

Fig. 4. Overview of Participants' Motivations for Crowdsourcing.

The most frequently studied and mentioned are motives related to individual interest in participating in the crowdsourcing initiatives, reputation, social-related (e.g. integration in a community) reasons and also the possibility to receive tangible returns from their contributions (e.g. financial rewards, employment).

However, one aspect worth mentioning with practical implication for management is that each community is a community and members react to different motives. It is highly desirable to somehow inquire members, so as, to what type of benefit would they expect for their contributions.

Care should be taken in future research as motivations for open source communities, for example, are expected to be different in organizational co-creation communities, yet similar in open social networks like Facebook or LinkedIn.

A related future direction for research would be inquiring individuals that are potential or past crowdsourcees to identify what are the motivations behind their contribution in each type of community/crowd. There is very limited existing research in this field of studies.

Another large number of publications looks into organizational implications of crowdsourcing initiatives, presented in Figure 5.

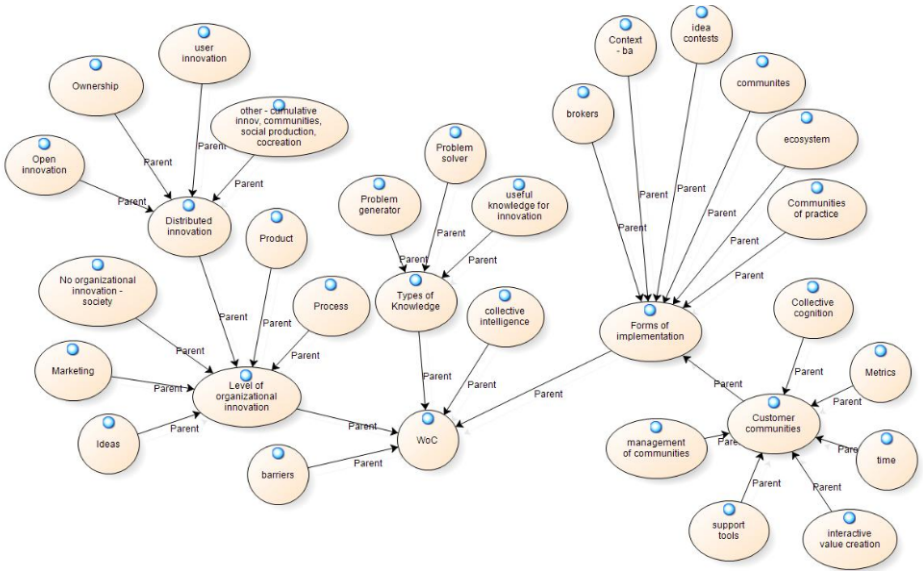

Fig. 5. Overview of Crowdsourcing: Exploratory Model.

Not all crowdsourcing initiatives are used for organizational innovation. Initiatives, which benefit society as a whole or have specific social impact are specific, e.g. citizen-sourcing suggested by Nam (2012, page 12): "citizen-sourcing initiatives: purpose (image-making or ideation), collective intelligence type (professional knowledge or innovative ideas), and strategy (contest, wiki, social networking, or social voting)".

When used for organizational innovation, crowd knowledge/information is typically used to generate ideas or to improve/develop new products.

A related concept is 'distributed innovation' i.e. the capacity to "manage knowledge in a distributed form, sharing knowledge and collaborating beyond the limits of their organizations" (Hildreth et al, 2000, cited in Albors et al., 2008, page 197), which includes three different approaches: user innovation (von Hippel, 1976; 1988; 2005), open innovation (Chesbrough, 2003; 2006) and cumulative innovation, communities, social production and co-creation (Benkler, 2006; Bogers et al., 2010; Murray and O'Mahony, 2007; West and Lakhani, 2008).

Regarding the way to implement crowdsourcing initiatives, we see the importance of understanding the communities, their contexts (Ba and democratization) and their participants and, above all, to see the crowds as ecosystems[1], where brokers and opinion makers (Ahonen and Lietsala, 2007; Antikainen et al., 2010; Chanal and Caron-Fasan, 2010; Kozinets, et al., 2008) play key roles.

Collective cognition processes go around the four types of social interaction suggested by Hargadon and Bechky (2006, pages 489 to 490), i.e. "help seeking, help giving, reflective reframing and reinforcing".

So, organizations may choose where they want to position and prepare their

[1] We suggest to go beyond the known definition i.e. "*an ecological system of factors which can be denominated the learning organization*" (Albors et al., 2008), and to see the crowd interacting with other crowds and various organizations, in a networked environment.

intervention, either through a visible branded action (e.g. idea contest, developing a specific community of users), or through a more discrete approach, using their employees or specific contracted specialists, to present themselves as individuals seeking for or giving help in specific communities (Saur-Amaral and Rego, 2010; 2011).

Particular care should be given to overcoming barriers to crowdsourcing. Intellectual property (ownership) issues are critical, as well as, access to specialist crowds (limitations of technology, computer-usage etc.) but most are related to the unpredictable behavior of crowds (crowdslapping, loss of interest in the community etc.).

Most barriers can be overcome by knowing crowd's (specifically key participants') motivations, defining shared ownership strategies, if possible, or establishing appropriate rewards for crowdsourcees.

To conclude, this means that for each type of organization, in order to manage the crowdsourcing process as a component of the distributed innovation management strategy, we may need to:

- Start by defining the role and impact of crowds for this strategy
- Then define, based on the organizational culture, management practices and overall strategy, the communities, which we want to develop or to source
- Comprehend participants' motivational drivers to participate in crowdsourcing initiatives
- Based on those motivation and type of crowd, choose appropriate toolkits to source it
- Define metrics to evaluate crowdsourcing success
- Comprehend ownership issues that may be raised and prepare intellectual property strategy

Start sourcing and monitor along the way and after the crowsourcing initiative has been concluded, to identify post-crowdsourcing motivations or feedback from participants.

5 Conclusions (and Future Work)

The main outcome of our study is the development of a framework showing how can the wisdom of the crowds be used to enhance organizational innovation, at what level of the organizational innovation (process, project, product/service, overall strategy) and based on what type of knowledge.

This framework is designed to assist innovation professionals and academics to understand how can the wisdom of the crowds be used to enhance organizational innovation, at what level of the organizational innovation (process, project, product/service, overall strategy) and based on what type of knowledge, as well as to suggest academic scholars to use it as a tool to validate in specific populations and further help science to get closer to practice and choose a better way to create an impact onto the economic development.

Any conceptual model should provide tools and research directions to scholars. Exploratory research perspectives should give space to more predictive approaches, using surveys or secondary data to validate existing approaches. This is valid for crowdsourcers' and crowdsourcees' motivations to participate in crowdsourcing initiatives, KPIs related to the measurement and monitoring of the impact crowdsourcing actions. Qualitative methods may be used yet in a multiple case

perspective or in netnographic longitudinal analysis and comparison of several communities.

While the methodology used to develop it, i.e. systematic literature review, is a sound approach and duly applied in this study, there is an inherent limitation applicable to all conceptual models: they have not been validated empirically. Therefore, the applicability and validity of our framework fully depends on future empirical studies where its key dimensions can be confirmed or rejected.

5 References

Ahonen, M., & Lietsala, K. (2007). Managing Service Ideas and Suggestions–Information Systems in Innovation Brokering. Innovation Brokering. *Tekes Haas Conference of Service Innovation* Citeseer.

Antikainen, M., Mäkipää, M., & Ahonen, M. (2010). Motivating and supporting collaboration in open innovation. *European Journal of Innovation Management, 13*(1), 100-119.

Albors, J., Ramos, J. C., & Hervas, J. L. (2008). New learning network paradigms: Communities of objectives, crowdsourcing, wikis and open source. *International Journal of Information Management*, *28*(3), 194-202.

Almeida, J. M., Goncalves, M. A., Figueiredo, F., Pinto, H., & Belem, F. (2010). On the Quality of Information for Web 2.0 Services. *IEEE Internet Computing*, *14*, 47-55.

Andersson, E. R. (2009). System group idealogue approach to innovation: scientific basis and practitioner guidelines. *European Journal of Innovation Management*, *12*(2), 177-199.

Battistella, C., & Nonino, F. (2012). What drives collective innovation? Exploring the system of drivers for motivations in open innovation, Web-based platforms. *Information Research*, *17*(1), 17-1.

Baumoel, U., Georgi, S., Ickler, H., & Jung, R. (2009). Design of New Business Models for Service Integrators by Creating Information-Driven Value Webs Based on Customers' Collective Intelligence. In: System Sciences, *HICSS '09. 42nd Hawaii International Conference* on, 5-8 Jan. 2009.

Bayus, B. (2013). Crowdsourcing New Product Ideas over Time: An Analysis of the Dell IdeaStorm Community. *Management Science*, *59*(1), 226-244.

Becker, M. (2011). Managing dispersed knowledge: organizational problems, managerial strategies and their effectiveness. *Journal of Management Studies*, *38*(7), 1037-1051.

Bernoff, J., & Li, C. (2008). Marketing - Harnessing the power of the oh-so-social web. *MIT Sloan Management Review*, 49(3), 36.

Bogers, M., & West, J. (2012). Managing Distributed Innovation: Strategic Utilization of Open and User Innovation. *Creativity and Innovation Management*, *21*(1), 61-75.

Bonabeau, E. (2009). Decisions 2.0: The power of collective intelligence. *MIT Sloan Management Review*, *50*(2), 45-52.

Brabham, D. C. (2008). Crowdsourcing as a model for problem solving: An introduction and cases. *Convergence: the international journal of research into new media technologies, 14*(1), 75-90.

Brabham, D. C. (2012). The myth of amateur crowds: A critical discourse analysis of crowdsourcing coverage. *Information, Communication & Society*, *15*(3), 394-410..

Briner, R. B., & Denyer, D. (2012). Systematic review and evidence synthesis as a practice and scholarship tool. *Handbook of Evidence-Based Management: Companies, Classrooms and Research*, 112-129.

Buckley, S., & Giannakopoulos, A. (2010). *Sharing Knowledge in a Knowledge City Using CoPs*, Nr Reading, Academic Conferences Ltd.

Buggie, F. D. (2007). *The Wisdom of (Expert) Crowds*. Boston: Harvard Business School Publication Corp.

Chanal, V., & Caron-Fasan, M. L. (2010). The difficulties involved in developing business models open to innovation communities: The case of a crowdsourcing platform. *Management*, *13*(4), 318-340.

Charmaz, K. (2006). *Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis*, London: SAGE.

Crossan, M. M., & Apaydin, M. (2010). A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. *Journal of Management Studies*, *47*(6), 1154-1191.

Cummings, S., Davenport, S., Campbell, C., & Daellenbach, U. (2010). 'Problemsourcing': IRL's 'What's Your Problem New Zealand?' In the Proceedings of the 2010 *ISPIM Conference*. Bilbao, Spain, 6-9 June 2010.

Dahlander, L., & Magnusson, M. (2008). How do Firms Make Use of Open Source Communities? *Long Range Planning*, *41*(6), 629-649.

Datta, R. (2008). Collective intelligence: tapping into the wisdom of crowds. *Knowledge Management Review*, 11(3), 3.

Denyer, D., & Tranfield, D. (2009). Producing a systematic review. In A.D. Buchanan, & Bryman, A. (Eds), *The Sage handbook of organizational research methods* (pp. 671-89). Thousand Oaks, CA: Sage Publications.

Duboff, R. S. (2007). The Wisdom of (Expert) Crowds. *Harvard Business Review*, *85*(9), 28.

Ebner, W., Leimeister, J. M., & Krcmar, H. (2009). Community engineering for innovations: the ideas competition as a method to nurture a virtual community for innovations. *R&D Management*, *39*(4), 342-356.

Ebner, W., Leimeister, M., Bretschneider, U., & Krcmar, H. (2008). Leveraging the Wisdom of Crowds: Designing an IT-Supported Ideas Competition for an ERP Software Company. In: *Hawaii International Conference on System Sciences*, Proceedings of the 41st Annual, 7-10 Jan. 2008 2008. (p. 417).

Elmquist, M., Fredberg, T., & Ollila, S. (2009). Exploring the field of open innovation. *European Journal of Innovation Management*, *12*(3), 326-345.

Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, *39*(4), 311-316.

Ghafele, R., & Gibert, B. (2011). Crowdsourcing patent application review: leveraging new opportunities to capitalize on innovation? *Intellectual Property Quarterly*, *3*(1), 23-30.

Haller, J. B. A., Bullinger, A. C. & Möslein, K. M. (2011). Innovation Contests. Business & *Information Systems Engineering*, *3*(2), 103-106.

Han, S. (2010). Theorizing New Media: Reflexivity, Knowledge, and the Web 2.0. *Sociological Inquiry*, *80*(2), 200-213.

Hargadon, A., & Bechky, B. (2006). When Collections of Creatives Become Creative Collectives: A Field Study of Problem Solving at Work. *Organization Science, 17*(4), 484-500.

Haythornthwaite, C. (2009). Crowds and Communities: Light and Heavyweight Models of Peer Production. In: System Sciences, *HICSS '09. 42nd Hawaii International Conference* on, 5-8 Jan. 2009.

Hempel, J. (2006). *Big Blue Brainstorm*. Retrieved August 11, 2015, from the Business Week Website: http://www.bloomberg.com/bw/stories/2006-08-06/big-blue-brainstorm.

Herzog, S. M., & Hertwig, R. (2011). The wisdom of ignorant crowds: Predicting sport outcomes by mere recognition. *Judgment and Decision Making*, *6*(1), 58-72.

Hill, S., & Ready-Campbell, N. (2011). Expert Stock Picker: The Wisdom of (Experts in) Crowds. *International Journal of Electronic Commerce*, *15*(3), 73-102.

Howe, J. (2006). *The Rise of Crowdsourcing*. Retrieved December, 26, 2010, from the Wired Magazine Website:

http://www.wired.com/wired/archive/14.06/crowds.html.

Howe, J. (2008). *Crowdsourcing: Why the Power of the Crowd is Driving the Future of Business*, Lisboa: Actual Editora.

Huberman, B. A., Romero, D. M., & Wu, F. (2009). Crowdsourcing, attention and productivity. *Journal of Information Science*, *35*(6), 758-765.

Hudson-Smith, A., Batty, M., Crooks, A., & Milton, R. (2009). Mapping for the Masses Accessing Web 2.0 Through Crowdsourcing. *Social Science Computer Review*, *27*(4), 524-538.

Hutter, K., Hautz, J., Fuller, J., Mueller, J., & Matzler, K. (2011). Communitition: The Tension between Competition and Collaboration in Community-Based Design Contests. *Creativity and Innovation Management*, *20*(1), 3-21.

İren, D., & Bilgen, S. (2012). *Methodology for Managing Crowdsourcing in Organizational Projects. Future Internet Applications*. Retrieved August 11, 2015, from the University of Würzburg Website:

http://www3.informatik.uni-wuerzburg.de/events/summerschool2012/proceedings/Iren.pdf

Jashapara, A. (2007). Moving beyond tacit and explicit distinctions: a realist theory of organizational knowledge. *Journal of Information Science*, *33*(6), 752-766.

Jouret, G. (2009). Inside Cisco's Search for the Next Big Idea. Harvard Business Review, 87(9), 43-45.

Kang, K. H., & Kang, J. (2010). How do firms source external knowledge for innovation? Analysing effects of different knowledge sourcing methods. *International Journal of Innovation Management, 13*(1), 1-17.

Kho, N. D. (2006). iStockphoto stocks up on video. *EContent-Digital Content Strategies and Resources*, 29(8), 12-13.

Kittur, A., & Kraut, R. E. (2008). Harnessing the wisdom of crowds in wikipedia: quality through coordination. *In Proceedings of the 2008 ACM conference on Computer supported cooperative work (pp. 37-46)*. ACM.

Kiva. (2011). Kiva.org Available online at http://www.kiva.org [Last accessed: August 11th, 2015].

Kofinas, A., & Saur-Amaral, I. (2008). 25 years of knowledge creation processes in pharmaceutical industry: contemporary trends. *Comportamento Organizacional e Gestão, 14*(2), 257-280.

Kozinets, R. V., Hemetsberger, A., & Schau, H. J. (2008). The wisdom of consumer crowds. *Journal of Macromarketing*, 28(4), 339-354.

Leimeister, J. M. (2010). Collective Intelligence. *Business & Information Systems Engineering, 2*(4), 245-248.

Leimeister, J. M., Huber, M., Bretschneider, U., & Krcmar, H. (2009). Leveraging Crowdsourcing: Activation-Supporting Components for IT-Based Ideas Competition. *Journal of Management Information Systems, 26*(1), 197-224.

Levenshus, A. (2010). Online Relationship Management in a Presidential Campaign: A Case Study of the Obama Campaign's Management of Its Internet-Integrated Grassroots Effort. *Journal of Public Relations Research, 22*(3), 313-335.

Lipton, J. D. (2009). From domain names to video games: the rise of the internet in presidential politics. *Denver University Law Review, 86*, 693-708.

Littlejohn, A., Milligan, C., & Margaryan, A. (2012). Charting collective knowledge: Supporting self-regulated learning in the workplace. *Journal of Workplace Learning, 24*(3), 226-238.

Liu, Y., Huang, X. J., Ani, A. J., & Yu, X. H. (2008). Modeling and Predicting the Helpfulness of Online Reviews. *In Proceedings of the 8th IEEE International Conference on Data Mining*. Los Alamitos: IEEE Computer Soc.

Lopez, V., Nikolov, A., Fernandez, M., Sabou, M., Uren, V., & Motta, E. (2009). Merging and Ranking Answers in the Semantic Web: The Wisdom of Crowds. In: A. Gómez-Pérez., Y. Yu., & Y. Ding. (Eds.), *The semantic web* (pp. 135-152). Springer Berlin Heidelberg.

Luo, S., Xia, H., Yoshida, T., & Wang, Z. (2009). Toward collective intelligence of online communities: A primitive conceptual model. *Journal of Systems Science and Systems Engineering, 18*(2), 203-221.

Malone, T. W. (2008). What is collective intelligence and what will we do about it. Collective Intelligence: *Creating a Prosperous World at Peace, Earth Intelligence Network, Oakton, Virginia*, 1-4.

Malone, T. W., Laubacher, R., & Dellarocas, C. (2009). Harnessing crowds: Mapping the genome of collective intelligence. *MIT Sloan Research Paper* No. 2009-001, Cambridge.

Mayo-Wilson, C., Zollman, K., & Danks, D. (2010). *Wisdom of the Crowds vs. Groupthink: Learning in Groups and in Isolation*. Technical Report No. CMU-PHIL-188, Retrieved August 11, 2015 from the Dietrich College of Humanities and Social Sciences Website:

http://repository.cmu.edu/cgi/viewcontent.cgi?article=1100&context=philosophy

Muhdi, L., Daiber, M., Friesike, S., & Boutellier, R. (2010). Crowdsourcing: an alternative idea generation approach in the early innovation process. *In the Proceedings of 2010 ISPIM Conference*. Bilbao, Spain, 6-9 June 2010.

Nam, T. (2012). Suggesting frameworks of citizen-sourcing via Government 2.0. *Government Information Quarterly, 29*(1), 12-20.

Nishida, T. (2011). Social intelligence design for intercultural communication. *In the Proceedings of the Granular Computing (GrC), IEEE International Conference*, 8-10 Nov. 2011.

Park, S. T., & Pennock, D. M. (2007). Applying Collaborative Filtering Techniques to Movie Search for Better Ranking and Browsing, New York: Assoc Computing Machinery.

Pittaway, L., & Cope, J. (2007). Entrepreneurship education a systematic review of the evidence. *International Small Business Journal, 25*(5), 479-510..

Potter, A. (2010). *Economy: The case for a bright future*. Retrieved August 11, 2015 from the Canadian Business Website:

http://www.canadianbusiness.com/lifestyle/economy-the-case-for-a-bright-future/

Ray, R. (2006). Prediction Markets and the Financial" Wisdom of Crowds". *The Journal of Behavioral Finance, 7*(1), 2-4.

Reissberg, A. (2011). The Advanced Syntegration as the Most Effective and Efficient Tool for Large-Scale Disaster Response Coordination. *Systems Research and Behavioral Science, 28*(5), 455-464.

Riedl, C., Blohm, I., Leimeister, J. M., & Krcmar, H. (2010). Rating scales for collective intelligence in innovation communities: Why quick and easy decision making does not get it right. *International Journal of Electronic Commerce, 17*(3), 7-36.

Santonen, T., & Lehtelä, M. (2010). Higher Education Student's Motivation to Participate in Online Mass Innovation: Case Massidea.org. *In the Proceedings of the 2010 ISPIM Conference*. Bilbao, Spain, 6-9 June 2010.

Saur-Amaral, I. (2010). Revisão sistemática da literatura, Lisboa, Bubok.

Saur-Amaral, I. (2011). Revisão sistemática da literatura com Endnote X4, Lisboa, Bubok.

Saur-Amaral, I., & Amaral, P. (2010). Contract innovation organisations in action: doing collaborative new product development outside the firm. *International Journal of Technology Intelligence and Planning, 6*(1), 42-62.

Saur-Amaral, I., Nugroho, Y., & Rego, A. (2011). Innov@tion Intelligence: Advances in Understanding Knowledge Sourcing in Social Networks. *In the Proceedings of the 2011 ISPIM Conference*. Hamburg, Germany, 12-15 June.

Saur-Amaral, I., & Rego, A. (2010). Innovation intelligence: crowdsourcing in a social network. *International Journal of Technology Intelligence and Planning, 6*(3), 288-299.

Schaffers, H., Komninos, N., Pallot, M., Trousse, B., Nilsson, M., & Oliveira, A. (2011). Smart cities and the future internet: towards cooperation frameworks for open innovation. *Future Internet Assembly*, *6656*, 431-446.

Schenk, E., & Guittard, C. (2009). Crowdsourcing: What can be Outsourced to the Crowd, and Why? In Workshop on Open Source Innovation, Strasbourg, France.

Schweisfurth, T., Raasch, C., & Herstatt, C. (2011). Free revealing in open innovation: A comparison of different models and their benefits for companies. *International Journal of Product Development, 13*(2), 95-118.

Solomon, M. (2006). Groupthink versus the Wisdom of Crowds: The Social Epistemology of Deliberation and Dissent. *The Southern Journal of Philosophy, 44*(Supplement), 28-42.

Surowiecki, J. (2005). The Wisdom of Crowds. New York: Anchor Books.

Thayer, A. (2001). Lilly launches challenging site-InnoCentive seeks to lure researchers into solving posted chemical problems. *Chemical & Engineering News, 79*(27), 5.

Thayer, A. M. (2006). Innocentive opens research doors. *Chemical & Engineering News, 84*(26), 24-25.

Tödtling, F., Lengauer, L. & Höglinger, C. (2011). Knowledge Sourcing and Innovation in “Thick” and “Thin” Regional Innovation Systems-Comparing ICT Firms in Two Austrian Regions. *European Planning Studies, 19*(7), 1245-1276.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management, 14*(3), 207-222.

Tranfield, D., & Mouchel, D. D. (2002). Developing an evidence-based approach to

management knowledge using systematic review. *Advanced Management Research Centre, Cranfield School of Management*.

Tzeng, C. H. (2009). A review of contemporary innovation literature: A Schumpeterian perspective. Innovation: Management, Policy & Practice, 11(3), 373-394.

Vojnovic, M., & Dipalantino, D. D. (2010). Crowdsourcing and All-Pay Auctions. *In the Proceedings of the 19th International conference on World Wide Web*. April 26-30.

Vuković, M. (2009). Crowdsourcing for enterprises. In Services-I, 2009 World Conference (pp. 686-692). IEEE.

Wagner, C., Zhao, S., Schneider, C., & Huaping, C. (2010). The Wisdom of Reluctant Crowds. *In the Proceedings of the HICSS, 43rd International Conference*. Hawai, 5-8 January.

Walker, K. (2010). A systematic review of the corporate reputation literature: Definition, measurement, and theory. *Corporate Reputation Review, 12*(4), 357-387.

Welinder, P., Branson, S., Belongie, S., & Perona, P. (2010). The multidimensional wisdom of crowds. *In the Proceedings of the Conference on Neural Information Processing Systems (NIPS)*.

Wexler, M. N. (2011). Reconfiguring the sociology of the crowd: exploring crowdsourcing. *The International Journal of Sociology and Social Policy*, 31(1/2), 6-20.

Yang, Y. (2012). *Open innovation contests in online markets: Idea generation and idea evaluation with collective intelligence*. Temple University.

Yue, P., & Blevis, E. (2011). A survey of crowdsourcing as a means of collaboration and the implications of crowdsourcing for interaction design. In the Proceedings of the 2011 *Collaboration Technologies and Systems International Conference (CTS)*. Philadelphia, Pennsylvania, USA, 23-27 May.

Appendix: The Review Protocol

Components	Content and rationale
Research goal	We perform the review to identify how crowdsourcing can be used to support organizational innovation, in what situations, with what outcomes and with what differentiated approaches according to the crowd being sourced. We aim to develop a conceptual framework to synthesize key dimensions of crowdsourcing for innovation who can assist innovation professionals and academic scholars to identify approaches and gaps.
Research topic	Refer to section dedicated to wisdom of crowds and crowdsourcing for innovation to see current perspectives over the research topic.
Keywords	Wisdom of crowds; crowdsourcing; collective innovation; collective brain
Research scope	As the research topic has been studied by practitioners and academic scholars, with different perspectives and goals, we decided to combine the search from three databases that cover academic scientific knowledge and practitioner s' opinions and studies on the topic. Our choice fell upon ISI Current Contents (scientific database, impact factor journals), Scopus (broader scientific database), and ABI Inform

Components	Content and rationale
	(peer-reviewed journals and opinion journals). As the three databases may have some articles in common, we will check for duplicates. We will perform the search only in social sciences databases, as we are looking for impact of crowdsourcing on innovation, which is studied in social sciences – business and administration. We will also search in Google Scholar, however in this case we need to do it in full text and we cannot export abstracts. We'll look for full text instead.
Search equation	**("wisdom of crowds" OR crowdsourcing OR brain) AND collective AND innovat*** We will search in the available field in each database that allows us to look into text contained in abstract, title and keywords, in order to ensure a focused, yet not too restricted search (as it would have been the case of title or keywords search only).
Technical concerns	We will use the database filters to refine the results, when applying criteria like publication year or language, if available. Results for descriptive and thematical analysis and reporting will be exported to Endnote X5, where a preliminary relevance analysis will be performed. After that, relevant results will be exported to xml and from this format they will be imported to NVivo9 for thematic analysis and obtaining descriptive data for statistical treatment.
Inclusion criteria	Relevant results: • are articles, books and any other published material or communicated in a written form; • have an abstract or an introduction available to the researcher, in English; • have been published or communicated in writing from 2004 to date.
Quality and validity criteria	We will record all steps during the data collection and apply duly the criteria specified in this review form. As it is not possible, due to operational limitation, to perform the same search by another researcher, the main researcher will perform the search twice, in two consecutive days, and compare results. If differences are identified, reason for that should be identified and kept the correct set of results.
Data extraction	We will extract data from the scientific databases using the export citation function available in each database, preferably applied to all results at once, in a given database. Data will be exported in a dedicated Endnote database, and we will count records at exit in the online database and at entry in Endnote. Same procedure will be considered when relevant records will be exported in xml and then into NVivo.

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Open innovation in SMEs-towards formalization of openness[1]

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Abstract. Open innovation has been widely debated in management literature. However, little attention has been given to how small and medium sized enterprises manage to open up their innovation process. Consequently, various questions remain unanswered. In particular, we want to shed light on the following issue: how small and medium-sized enterprises manage organizational changes in their journey from closed to open innovation. A literature review examines how small and medium-sized enterprises open up their innovation process based on nine perspectives. Then, the reference framework addresses the organizational changes embedded in evolving from closed to open innovation. In this sense, we use acknowledged concepts on organizational change research to carry out an in depth-case study on a small and medium-sized enterprise evolving in the sports equipment industry. The results demonstrate that, in its journey from closed to open innovation, the small and medium-sized enterprise has to stimulate and to manage changes to four company's dimensions i.e. corporate culture, networking, organizational structure and knowledge management systems. The paper concludes by highlighting the diverse organizational changes undertaken by the company on these four dimensions. Based on this paper's conclusion, managerial implications and discussion for future research are drawn.

Keywords: Open Innovation, SME, Business Management, Decision Making, Knowledge Management, Entrepreneur.

1 Introduction

Open innovation is a growing field of interest among practitioners and scholars (Chesbrough and Appleyard, 2007; Gassmann et al., 2010). Since new phenomena emerge from leading industries, such as, software, telecommunication, electronics, biotechnological, and pharmaceutical, previous theories, such as, Corporate Strategy (Ansoff, 1965), customer active paradigm (von Hippel, 1978), absorptive (Cohen and Levinthal, 1990)/ receptive capacity (Hamel, 1991)/ dynamic capabilities (Teece et al., 1997) seemed to be limited to fully explain the activities undertaken by those companies (Chesbrough, 2003). In fact, these industries expand on opening up their innovative process using external resources, such as, networks, innovation communities, volunteer contributors and ecosystems as sources of value creation (Chesbrough and Appleyard, 2007). Companies such as UNIX (Linux), IBM, and LEGO (Lego MindStorm), among others, have been largely investigated by academics.

Consequently, academics started to study those industries. Chesbrough (2003) elaborates on the phenomenon of value creation through integration of external

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resources and externalization of internal ones. He coined it open innovation, which tends to provide a holistic view of the phenomenon. Even though some argue that open innovation is comparable to above cited theories (Aylen, 2010; Elmquist et al., 2009), most acknowledge that Chesbrough's approach adds a more holistic dimension (Gassmann et al., 2010; Huizingh, 2010) and emphasizes the relevance of IP (Huston and Sakkab, 2006; Piller and Walcher, 2006). Chesbrough et al. (2006, p. vii) define open innovation as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand markets for external use of innovation, respectively". By reflecting on Chesbrough et al. (2006) definition, one can say that the definition is vague and wide. If every aspect of the above definition must be fulfilled, based on current empirical studies, only few companies are engaged into "real" OI. On the other hand, if the definition is taken apart (Gassmann and Enkel, 2004) then most companies could be considered to be engaged in OI. Trott and Hartmann (2009) also argue that OI should not be taken as the yin of the closed innovation yang. However, researchers need to bear in mind that not every form of collaboration is OI. For instance, Sony Ericsson collaborates on the supply chain view of "OI" described by Groen and Linton (2010), but is not engaged into OI, because they purposely use internal resources for innovation with some contact with external sources only; while Android purposely gives access to its technology for anyone to openly collaborate. Those examples being extremes, there might be other companies lying between those extremes. Taking into consideration the latter and that OI's definition is vague and wide, OI might take different forms and might appear to different degree.

Since academics focused most of their studies on large and multinational enterprises, small and medium sized enterprises (SMEs) were left on the side. Furthermore, Gassmann et al., (2010, p. 215) state that "while most of the firms described in early works on open innovation were large multinational firms, it has become apparent that smaller and medium- sized firms are also opening up their innovation process" (). Consequently, a few academics have focused their OI research on SMEs. van de Vrande et al. (2009) quantitatively tested trends, motives and challenges embedded in open innovation in SMEs; their results demonstrate that open innovation is widely spread among SMEs and more importantly keep on spreading. van de Vrande et al. (2009) also pinpoint the main issues related to opening up the innovation process for SMEs as being organizational and cultural barriers. Organizationally, previous studies demonstrated main barriers are related to venturing, external participation and outsourcing of R&D (van de Vrande et al., 2009). Culturally, main barriers are related to the not-invented-here (NIH) syndrome and lack of internal commitment (Chesbrough and Crowther, 2006; Katz and Allen, 1982). In line with van de Vrande et al. (2009) conclusion, academics examine what SMEs can do so as to reduce the cultural and organizational barriers to open innovation. As a result, Ramos et al. (2009) address the open knowledge and technology transfer issue. Mogollon et al. (2010) concentrate on the importance of open-mindedness for implementing open innovation to overcome cultural barriers in SMEs. A study from Lee et al. (2010) suggests the participation of intermediaries facilitating the implementation of open innovation in SMEs.

However, during our research we were not able to find published studies focusing on open innovation in SMEs that study the form of the organizational changes bound with SMEs evolving from closed to open innovation perspective. This goes along with Chiaroni et al. (2010, p. 1) stating that "an issue that deserves further attention is the anatomy of the organizational change process through which a firm evolves from being a Closed to an Open Innovator.". Moreover, previous studies (e.g. Chesbrough, 2003) show that companies being engaged in open innovation are far more competitive than others-e.g. UNIX (Linux), Procter and Gamble (Connect and Develop), LEGO (Lego MindStorm) - thus this increases interest in seeing whether

SMEs could reap the same benefits. Consequently, this paper wants to address the knowledge gap existing between implementing open innovation and SMEs theories. As a first attempt to understand how SMEs implement open innovation, the following research question is formulated:

> *"How do SMEs try to overcome the organizational and cultural barriers when evolving from closed to open innovation?"*

The aim is to describe how SMEs implement open innovation by addressing the issue of organizational and cultural barriers needed to be overcome when SMEs evolve from closed to open innovation. In order to understand this context and to further develop the language of SMEs empirical data are collected through a case study.

The article is structured as follows: the second section consists of a review of relevant literatures on OI. The third section develops a reference framework for this study, derived from the literature review, to be used as a guide to gather and analyze data. The fourth section consists of an analysis of collected data. The final section concludes this article and launches a discussion for future researches.

2 Literature review

As previously stated, most of existing research carried out on open innovation (OI) uses data from MNE's. Consequently, due to limited number of studies on SMEs, the following proposition has been made: in order to understand the challenges faced by SMEs in their journey from closed to open innovation, both closed and open innovation perspectives (Chesbrough, 2003) need to be discussed. Through, Gassmann et al. (2010) nine perspectives along with research on OI streams in MNEs, the challenges faced by MNEs are identified. We choose to base our reflection on Gassmann et al. (2010) perspectives considering this scholar has been studying OI for years. Moreover, he has been working with influential scholars in the OI field such as, among others, Henry Chesbrough, Wim Vanhaverbeke and Ellen Enkel. Thanks to Gassmann et al. (2010) theoretical frame, we drew a combined theoretical and practical overview of open innovation (Dufour and Son, 2011). By combining the challenges faced by MNEs in opening up their innovation process and theories on SMEs intrinsic characteristics, we pinpoint the challenges faced by SMEs (for more details, please refer to Dufour and Son, 2011).

2.1 From closed to open innovation

Chesbrough (2003) introduces open innovation as an alternative to traditional internal innovation in large companies. He describes OI as a means of commercializing internal and external ideas thanks to internal and external tools. As Chesbrough (2003, pp. 36-37) puts it: "in this new model of open innovation, firms commercialize external (as well as internal) ideas by deploying outside (as well as in-house) pathways to the market". In this approach, Chesbrough (2003) argues that closed innovation-traditional internal innovation-is not the strategic asset it was before. Companies could not carry out innovation on their own while remaining competitive, because of increased complexity of products and technologies (Chesbrough, 2003). As a consequence, companies were forced to find new ways for innovating. Chesbrough and Appleyard (2007) add that ownership, entry barriers, switching costs and intra-industry rivalry were of great importance in closed innovation, whereas they are secondary items within OI; in other words, closed and open innovation present crucial generic differences. Chesbrough (2003) identifies that the main difference resides in the internal-external dualism. On the one hand, Chesbrough's closed innovation philosophy requires everything to be done in-house. On the other hand,

Chesbrough's OI philosophy advocates for openness towards other actors (Chesbrough, 2007). The above discussion indicates that we consider Chesbrough's definition from before to be considered as if a firm is using OI if they are open in only one or a few parts of their innovation activities. In this study we connect to this view.

Table 1. Contrasting principles of closed and open innovation

Closed innovation principles	Open innovation principles
The smart people in our field work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it ourselves	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win	If we make the best use of internal and external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

Note: Inspired from "The era of open innovation" by Chesbrough, 2003, Sloan Management Review, 44(3), 38.

Table 1 underlines, among other things, the internal-external duality existing between Chesbrough's closed and open innovation model. There is a high self-reliance level in closed innovation; for instance, discovering, developing, shipping, commercializing, creating, are actions that should be conducted in-house in an extreme closed innovation setting. On the contrary, an extreme open innovation setting advocates actions taken in-house, as well as, externally to cope with current products and technologies complexity. In other words, OI is about tapping into knowledge of experts outside companies to complement for companies' internal knowledge; balancing internal and external R&D; taking advantage of others' discoveries; carefully thinking business model instead of being first on the market; balancing internal and external ideas; taking advantage of others' use of owned IP and taking advantage of others' IP when it embraces companies' business model. Those two innovation models are extreme pictures; consequently, some scholars end up believing that the best chance to sustain open innovation relies on balancing traditional business strategy with open initiatives (Chesbrough and Appleyard, 2007; Chiaroni et al., 2010; Enkel et al., 2009; Pontiskoski and Asakawa, 2009). Thus, we can extrapolate that companies also evolve between these two extremes. That is; basically every firm is involved in OI to some extent, even if most firms are involved to a very low degree. Only a few innovation projects (e.g. LINUX, LEGO MindStorm) could be considered to be assessed with a high degree of OI.

2.2 Review of open innovation and empirical findings in MNEs

As a consequence to Chesbrough's (2003) research, scholars have been studying OI under different streams in order to identify what MNEs do in order to achieve and

sustain OI. By studying those streams, scholars have brought practical solutions to the scientific world through empirical studies. Gassmann et al. (2010) group these different streams under nine perspectives. We choose to base our reflection on Gassmann et al. (2010) perspectives because he has been studying OI for years. Moreover, he has been working with influential scholars in the OI field such as, among others, Henry Chesbrough, Wim Vanhaverbeke, and Ellen Enkel. Consequently, he has a broad theoretical standpoint over OI that has allowed him to design a rather objective literature review on the topic. Thanks to Gassmann et al. (2010) theoretical frame, we draw a combined theoretical and practical overview of open innovation. First of all, the nine perspectives i.e. spatial, structural, user, supplier, leveraging, process, tool, institutional, and cultural are defined. Secondly, table 2 gathers what MNEs are recommended to do in order to succeed at opening up their innovation process.

The spatial perspective relates to the globalization of innovation. Thanks to access to markets and resources (Gassman, 2006), as well as, new communication and information channels increasing information sharing, innovation can be carried out by different parties located at different places in the world (Gassmann et al., 2010). This leads to the need of improved information sharing systems. The structural perspective relates to the increasing division of work in innovation. More complex technologies engender specialization. Specialization engenders alliances and R&D outsourcing (Gassmann et al. 2010; Hagedoorn and Duysters, 2002). As Chesbrough in Allio (2005, p. 24) puts it: "innovation overall is a team sport" . This is meant to increase competence sharing and innovation efficiency. The user perspective relates to the integration of users in the innovation process. This enables organizations to know users' requirements thanks to, for instance, toolkits or early involvement of users in the innovation process (von Hippel, 1986, 1988; von Hippel and Katz, 2002; Gassmann et al., 2010). The supplier perspective relates to the involvement of suppliers in the innovation process (Gassmann et al., 2010). Early involvement of suppliers in the innovation process significantly augments innovation performance (Hagedoorn, 1993, 2002). The leveraging perspective relates to the use of external technology and IP in order to leverage internal technology and IP, and vice-versa. Technology and/or IP neglected by an organization can be useful to another one (Gassmann et al., 2010). The process perspective relates to the three processes in open innovation. (1) The outside-in process, which consists of seeking out technologies outside the organization. (2) The inside-out process, which consists of selling out technologies. (3) The coupled process, which gathers the two previous ones (Gassmann and Enkel, 2004). The tool perspective relates to the set of tools that are required in order to integrate users and/or integrate external problem solvers to the innovation process (Gassmann et al., 2010). The institutional perspective relates to the free revealing of inventions, findings, discoveries and knowledge in order to accelerate innovation and get it more efficient (von Hippel and von Krogh, 2003, 2006). The cultural perspective relates to organization mindset. In open innovation, the not-invented-here mindset (Katz and Allen, 1982) is something that must be overcome (Chesbrough, 2003). This implies that value must be given to outside competence and know-how (Gassmann et al., 2010) to cope with increasing products and technologies complexity.

Table 2 below gathers recommendations brought to respectively each perspective on OI in MNEs. The left column displays the names of the perspectives on open innovation. In the right column lay the solutions elaborated by MNEs on the challenges they face to sustain open innovation. Those solutions were brought by scholars to the scientific world thanks to empirical studies. In order to avoid the pitfall of over-generalization we present in the right column what is recommended in order to succeed in implementing OI instead of what must be done in order to succeed.

Table 2. Perspective on OI vs. recommendations to succeed

Perspectives on open innovation	What is recommended in order to succeed
The spatial perspective	Codification of information
	Information and communication systems
The structural perspective	Keep core competencies and outsource the rest
	Have partners at disposal
	Adjust organizational structure
The user perspective	Early integration of users in innovation process
	Tool kits
	Virtual platforms
The supplier perspective	Early integration of suppliers in innovation process
The leveraging perspective	Balancing internal and external knowledge
The process perspective	Building networks
	Act as knowledge brokers
	Creation of external business units
The tool perspective	Development and/or use of tools such as users' toolkits, networks and problem solving platforms
The institutional perspective	Licensing
	Open initiatives
	Train employees and install checkpoints
The cultural perspective	Acceptance of openness
	From DIY to NIH
	Integration of innovation mentality and support of innovation

It can be assumed what MNEs carry out in order to succeed in implementing OI is inherent to their intrinsic characteristics. Equally, what SMEs are likely to carry out in order to succeed in implementing OI is inherent to their intrinsic characteristics too. As a result, drawing from results of empirical studies on OI in MNEs, it is possible to theoretically elaborate on what features of OI are likely to be achieved by SMEs and what features are not. Thus, after defining what SMEs are in European Union, it is interesting to look at the differing characteristics that exist between MNEs and SMEs. This helps us to identify what the challenges to OI are for SMEs.

2.3 Open innovation in small and medium-sized enterprise (SME)

In Europe, SMEs represent the majority of all enterprises by 99%. There is no doubt that SMEs play a central role in the European economy. They are the main source of entrepreneurial skills, employment and innovation. In 2005, within the 25 EU countries, there are 23 million SMEs providing approximately 75 million jobs.

Among practitioners and scientist no doubt sustains under, which SMEs and MNEs conduct their business differently in several aspects. This is because differences exist in policy making procedures, structure and utilizations of resources (Ghobadian and Gallear, 1997). In an attempt to clarify and compile theories on SMEs and MNEs, Ghobadian and Gallear (1997) elaborate on a comparative table highlighting the major differences between both kinds of enterprises. Table 3, below, highlights the

factors that, according to us, are the most relevant concerning the opening up of the innovation process in SMEs. Ghobadian and Gallear (1997) original table is designed for analyzing total quality management (TQM) but it still has a general value in terms of analyzing other aspects, such as OI, in SMEs. Some non-relevant factors to study OI in SMEs have been excluded compared to the original table from Ghobadian and Gallear (1997).

Table 3. Comparison between SMEs and MNEs

	Small and medium sized organizations	Large organizations
Structure	Flat with few layers of management, Flexible structure and information flows, Normally rapid response to environmental changes.	Hierarchical with several layers of management, Rigid structure and information flows, Normally slow response to environmental changes.
Procedure	Activities and operations not governed by formal rules and procedures. Low degree of standardization and formalization, Flexible and adaptable processes.	Activities and operations governed by formal rules and procedures. High degree of standardization and formalization Rigid and unadaptable processes.
Behavior	Mostly organic, Fluid culture.	Mostly bureaucratic, Culture inertia.
Processes	Strategic process incremental and heuristic.	Strategic process generally deliberate and formal.
People	Individual creativity encouraged, Dominated by pioneers and entrepreneurs, Modest human capital, financial resources and know-how.	Individual creativity stifled, Dominated by professionals and technocrats, Ample human capital, financial resources and know-how.
Contact	Normally dependent on a small customer base.	Greater scope for an extended customer base.

Note: Inspired from "TQM and organization size" by Ghobadian, and Gallear, 1997, International Journal of Operations and Production Management, 17(2), 128-129.

It is generally recognized that SMEs have usually an organic structure. In this structure, the level of specialization, standardization and formalization is rather low, while loose and informal working relationships prevail (Ghobadian and Gallear, 1997 (see table 3)). Plus, in a changing environment, organic structures that promote innovativeness and/ or adaptive behavior are the key to survival to the new situation (Burns and Stalker, 1966).

SMEs organizational flat structure and fewer layers of management result in a more flexible and adaptable work environment. Owing to their size, SMEs are on the strategic apex run by a single manager (Ghobadian and Gallear, 1997; Zahra and Filatotchev, 2004). Consequently, the decision making process is centralized to the manager with the effect that the manager can be either the main catalyst for change or the main stumbling block to change. Plus, diffusion of information and communication process, are more efficient and less complex to manage and organize within flat structure.

Since SMEs' culture rely on a fewer amount of people, once the need for change has been recognized, cultural change is easier to attain than in MNEs (Ghobadian and Gallear, 1997). However, the need for change seems to be harder to recognize in SMEs. This is due to limited resources and external contacts that can warn managers for changes, as well as, the style of management, high time pressure on SMEs' manager shoulders, and lack of clear processes and procedures to react quickly. Nonetheless, SMEs are result-oriented, which is a valuable trigger for attaining cultural change (Ghobadian and Gallear, 1997; Welsh and White, 1981).

Managers in SMEs are responsible for many facets of the enterprise and many decisions. As a result, the planning process is not formal. This implies that multi-functional planning arises within the mind of individuals. This subconsciously stimulates creativity among SMEs workers since no formal process exists and all doors remain opened (Ghobadian and Gallear, 1997). SMEs also regroup pioneers and entrepreneurs.

A major pitfall for SMEs is resources scarceness. SMEs suffer from an important lack of human capital, financial resources and know-how (Welsh and White, 1981; Ghobadian and Gallear, 1997; Caloghirou et al., 2004). Additionally, SMEs have a limited customer and supplier base, which both increases their bargaining power over enterprises. Nonetheless, this limited base allows SMEs to focus more intensively on their customers and suppliers needs (Ghobadian and Gallear, 1997).

2.4 Relating the nine perspectives of OI to the SME context

The description of MNEs and SMEs inherent characteristics show us the main differences existing between them. Combining OI practices in MNEs and differing characteristics between MNEs and SMEs, allow us to extrapolate on how challenging it can be for SMEs to sustain OI. Consequently, we present the results of this extrapolation. Some of our extrapolations are supported by previous studies on certain angles of OI in SMEs. Due to a lack of research on OI in SMEs, other ones only rely on inherent characteristics of SMEs. This analysis sheds light on the potential barriers to sustain OI that SMEs might suffer from, because of their inherent characteristics (for a more detailed approach, please refer to Dufour and Son, 2011).

The spatial perspective: SMEs activities and operations are governed by informal and loose procedures. Consequently, SMEs' environment is characterized as having a high degree of tacit knowledge (Teece, 2000). This organizational characteristic is recognized as being an issue to interact with external environment (van de Vrande et al., 2009), because, in order to be exchanged efficiently, information needs to be codified (Hacievliyagil and Auger, 2010). To transform tacit knowledge into codified

knowledge requires human intervention and knowledge on how to codify information through, for example, knowledge management systems. Although, based on Ghobadian and Gallear (1997) study, SMEs have limited human resource to be allocated to and know how to embrace this change. This can inherently result into the emergence of a potential knowledge management system barrier (Ramos et al., 2009).

The structural perspective: SMEs are already acquainted with identifying their core competencies and outsourcing some R&D activities (van de Vrande et al., 2009; Rundquist and Halila, 2010). Plus, SMEs are already heavily committed in collaborating through forming alliance to share risks, gather complementary competencies and create synergies (Lee et al., 2010). Nevertheless, SMEs are recommended to adapt their organizational structure in order to sustain OI (Hacievliyagil and Auger, 2010). Adapting their structure allow SMEs to avoid a potential barrier (van de Vrande et al., 2009). SMEs, as described by Ghobadian and Gallear (1997), have flat and organic structure. This is a plus point for SMEs to adapt their organizational structure. Indeed, this kind of structure allows flexible and adaptable work environment, which is of great support to adjust organizational structure required to open up the innovation process. Moreover, organic structure is recommended in a changing environment because it promotes innovativeness and/or adaptive behavior (Ghobadian and Gallear, 1997). However, adapting organizational structure remains a challenge that has to be overcome by SMEs in order to implement OI successfully.

The user perspective: integrating users in the network is a popular practice among SMEs (van de Vrande et al., 2009). The flat structure present in SMEs, as well as, the organic structure facilitates the early integration of users, due to their high level of flexibility (Ghobadian and Gallear, 1997; Lee et al., 2010). However, SMEs are not willing to integrate users by using similar toolkits and internet platforms as MNEs due to the investment it represents (Ramos et al., 2009). Consequently, by having incremental, heuristic process, encouraging individual creativity and promoting entrepreneurial behavior, SMEs manage to develop practices to integrate users that are unstructured and informal, and; thus, do not require massive investment (van de Vrande et al., 2009). SMEs can afford to interact with users in such a manner because they have small customer base.

The supplier perspective: as Gassmann et al. (2010) notice, this perspective has not been deeply investigated. Nonetheless, SMEs must enable supplier's early integration in their network, because it positively affects the innovation process (Gassmann, 2006). It has been argued in the user perspective that SMEs have positive features to integrate external partners; thus, by extension suppliers, as well. Based on SMEs relative small size, the proposition can be made that they have relative small supplier base. Implicitly, a second proposition can be made that SMEs can develop similar practices to integrate suppliers as the one used to integrate users i.e. unstructured and informal.

The Leveraging perspective: SMEs due to their lack of resources have always been forced to look for collaboration with other organizations in order to access lacking technologies and combine them with theirs (Ramos et al., 2009). Consequently, SMEs are used to scanning their environment in quest for missing technology and are used to not relying only on their internal R&D (Spithoven, et al., 2010). Thanks to flexible, adaptable, incremental and heuristic processes, SMEs are likely to be able to adjust their processes (such as knowledge management systems) to external findings in order to leverage their internal technologies and vice-versa. Encouraged individual creativity may also lead to find novel ways for combining external and internal technologies. This is supported by van de Vrande et al. (2009) who found that SMEs rely on initiatives of their employees.

The Process perspective: both inside-out and outside-in processes require the

building of networks to either internalize or externalize technologies. In spite of few contacts due to their small size and little number of employees, SMEs access additional networks through collaborative networks (Aguero and Sanchez, 2010). The outside-in process is carried out in MNEs through knowledge brokers. SMEs cannot afford knowledge brokers because of a lack of financial and human resources (Ramos et al., 2009). Moreover, SMEs small customer base leads to less feedback than with large customer base. Inside-out process is likely to happen in SMEs. Pioneering and entrepreneurial firms need to sell their finding in order to enlarge their resources pool. Unlike MNEs, SMEs are not able to create external business unit in order to develop and promote their finding because of a lack of resources (van de Vrande et al., 2009).

The Tool perspective: due to their lack of resources, SMEs cannot afford the utilization of existing tools, such as, knowledge management systems and crowdsourcing platforms (Ramos et al., 2009). It is even less likely that they develop their own platforms. Moreover, SMEs have small networks to help them.

The Institutional perspective: SMEs being pioneering and entrepreneurial firms are likely to be willing to license out technologies in order to earn money and thus enlarge their resources pool. However, licensing technologies requires prior financial investment, which few SMEs are able to afford (Van de Vrande et al., 2009; Bianchi et al., 2010). Another means of revealing technologies is to freely reveal it through open initiatives. SMEs might not want to reveal their discoveries because of the risk of losing their inherent rents. However, Harhoff et al. (2003) argue that purposeful divulgation of discoveries leads to enhancing technology and making innovation more efficient, which increases ulterior rents. To do so, SMEs must know what to disclose and what not to disclose by training their employees. Unfortunately, SMEs employees are used to dealing with informal rules and procedures. Training them to formal rules and procedures would require significant resources involvement. Moreover, training is not part of the average cultural mindset of SMEs (Mogollon et al., 2010).

The Cultural perspective: cultural mindset of SMEs is one of the main elements hindering open innovation implementation. Van de Vrande et al. (2009) identify cultural issues as one of the principal barriers to open innovation. Because SMEs are entrepreneurial firms, founders are likely to be willing to keep control on their firm and be reluctant to disclose information about their discoveries. Consequently, accepting openness is peculiarly difficult when founders are still taking part in the business (Mogollon et al., 2010) and so could become a barrier to openness.

This analysis identifies the main organizational and managerial challenges SMEs may face and have to sort out in their journey from closed to open innovation. As a result, SMEs are recommended to take up those challenges to sustain their transformation. Consequently, if not seriously managed, those challenges can turn into barriers to open innovation. In accordance with previous study, those possible barriers to OI can be clustered into four dimensions: corporate culture management, networking, organizational structure and knowledge management systems (van de Vrande et al., 2009; Ramos et al., 2009; Mogollon et al., 2010; Lee et al., 2010).

3 Reference framework

This section describes the reference framework used in order to collect and interpret empirical data gathered through a single in depth case study. This reference framework consists of both organizational change theory and open innovation research. Moreover, parts of this reference framework are based on Chiaroni et al. (2010) study. This study presents important similarities to ours and was completed successfully.

3.1 Organizational change

The journey from closed to open innovation presents forms of organizational change. Chiaroni et al. (2010) demonstrate that this journey in MNEs and organizational change look alike thanks to four elements. Firstly, like organizational change, implementation of OI engages variation in both modes of action and cognition to make the most of external and internal possibilities. Secondly, cultural evolution from do-it-yourself mindset to not-invented-here mindset presents the same resistance to change as for organizational change. Thirdly, new routines must be established in both OI implementation and organizational change. Finally, like in organizational change, organizations implementing OI must go through a progressive trial and error process in order to establish their new environment.

The four elements of OI implementation described above apply to MNEs, as well as, SMEs. As a result, organizational change theory is an applicable method for studying OI implementation in SMEs and the potential barriers related to it.

One of the most famous organizational change models consists of three phases-unfreezing, moving, institutionalizing-and was developed by Lewin (1951). In order to have a more holistic view of each phase, we use Kotter (1996) that divides each phase in different stages. The first phase consists of establishing a sense of urgency, creating a guiding coalition to lead change, developing and communicating a vision. The second phase is aimed at empowering others to act and producing short-term wins. The third and last phase involves consolidating gains and anchoring the new culture.

Lewin's (1951) model consisting of three phases makes the organizational change easy to follow-starting point, moving phase and arrival-and so more reliable, as suggested by Chiaroni at al. (2010).

3.2 Barriers to OI implementation in SMEs

Understanding OI implementation requires identifying barriers that could hinder the journey from closed to open innovation. Our literature review identifies four potential barriers: corporate culture, networking, organizational structure and knowledge management systems. Those potential barriers to OI implementation, once known and mastered, can be utilized by managers to positively affect the journey from closed to open innovation. As Chiaroni et al. (2010, p. 225) put it: "they could also indeed be conceived as managerial levers on which a company can intervene to streamline its journey toward open innovation" .

Corporate culture. As demonstrated earlier, corporate culture in SMEs might hinder OI implementation. This is supported by Chesbrough and Crowther (2006) and van de Vrande et al. (2009). In SMEs, the cultural problem lies at the acceptance of openness (Mogollon et al., 2010). Once the acceptance of openness has occurred, cultural change in SMEs can be achieved relatively smoothly. Resistance to new culture acceptance in SMEs resides in their inherent characteristics (see table 3). Due to limited resources and external contacts, management style, high time pressure on SMEs' manager and lack of clear processes and procedures to react quickly, SMEs managers can miss warnings for change (Ghobadian and Gallear, 1997). Ghobadian and Gallear (1997) add that several factors can influence the culture of an organization i.e. education and training, employee participation programs, enhanced communication programs, revision of procedures and policies, modification of evaluation and reward system and behavior of top managers. One or more of these factors might be used by SMEs during their journey from close to open innovation.

Moreover, once the acceptance stage is reached, it is possible to plan cultural change. Senior and Swailes (2010, pp. 130-131) propose five steps towards cultural change that are the most widely accepted by scholars: "(i) assess the current situation, (ii) have some idea of what the aimed-for situation looks like; (iii) work out the what and how of moving the organization, or part of it, away from its current culture to what is perceived to be a more desirable one; (iv) intervene to bring about cultural change; and (v) monitor outcomes and adjust as needed".

Networking. As previously stated, SMEs have limited human resources, customers and suppliers base at disposal; consequently a rather limited network. A first step to overcome this issue is moving employees' network from an individual level to an organizational level (Chesbrough, 2003). But since, OI relies on the establishment of extensive networking; it is relevant for SMEs to find out additional ways to increase their network. In an attempt to enhance this issue, academics recommend SMEs to form inter-organizational relationship with universities and research centers (Ramos et al., 2009; Spithoven et al., 2010). Ramos et al. (2009) and Spithoven (2010) argue that both universities and research centers can act as knowledge brokers for SMEs by developing adapted information and communication tools and gathering a relevant amount of SMEs within research centers. Thus, by taking part into such activities SMEs can enlarge their network.

Laursen and Salter (2006) elaborated two variables allowing a company network to be measured in term of breadth i.e. the number of external sources or search channels that firms rely on, and depth i.e. the extent to which firms draw deeply from the different external sources or search channels. Firms using an open search strategy are more innovative than others (Chesbrough, 2003; Laursen and Salter, 2006), but open search strategy is costly (Cantner et al., 2009; Laursen and Salter, 2006). At a certain point openness, in terms of breadth and depth, can negatively influence innovation performance (Ibid.); Cantner et al. (2009) empirically demonstrate the inverted U-shape of network's breadth/depth and firms' innovative capacity. As a result, using too many external sources and search channels are time consuming, laborious and too expensive compared to resulting benefits (Cantner et al., 2009).

Organizational structure. Managing externally collected technology requires SMEs to adapt their organizational structure (Hacievliyagil and Auger, 2010). Even if SMEs possess favorable characteristics in order to adapt their organizational structure, this remains a challenge they must overcome in order to implement OI successfully. To do so, SMEs must increase their absorptive capacity; that is, the ability of recognizing valuable external technologies and to appropriate these external technologies. This can be done through technology intermediation (Spithoven et.al., 2010). However, technology intermediation in the case of SMEs is still a fuzzy concept. According to Spithoven et al. (2010), SMEs might require help from third parties in order to scan the market for new technologies and absorb them. These third parties can be, for instance, collective research centers where SMEs share R&D equipment, knowledge and knowledge on how to appropriate technologies. Furthermore, where SMEs do not have sufficient resources to afford knowledge brokers and crowdsourcing platforms, Ramos et al. (2009) propose that these roles are taken up by universities in order to help SMEs developing. Naturally, this also requires SMEs to have efficient knowledge management system (Hacievliyagil and Auger, 2010); this is discussed in the next section.

Knowledge management systems (KMS). It is acknowledged that SMEs cannot afford information and communication technology platforms as MNEs do (Nunes et al., 2006; Ramos et al., 2009). In a closed innovation perspective the need for KMS is mostly denied by managers (Nunes et al., 2006). There exist various explanations for this behavior. SMEs are acquainted with sharing information through informal

approaches (Ghobadian and Gallear 1997)-so called "between two ears" talks (Nunes et al., 2006). Plus, it is a long term investment and return on it is difficult to be obtained. As a result, developing KMS in a closed environment is not predominant (Nunes et al., 2006). Nevertheless, in an open innovation perspective, the need for KMS is more predominant since inter actions exist between organizations. Theorists acknowledge that OI enhances competiveness and innovativeness (Chesbrough 2003; Nunes et al., 2006). Thus, return on investment on KMS for SMEs managers engaged in OI is more tangible. Consequently, it helps managers implement KMS in SMEs.

Consequently, the establishment of knowledge management systems is more likely to be implemented in SMEs engaging in the journey from closed to open innovation (Gassmann et al., 2010). Nunes et al. (2006, p. 106) define KMS as "the process of critically managing knowledge to meet existing needs, to identify and exploit existing and acquired knowledge assets and artefacts and to develop new knowledge in order to take advantage of new opportunities and challenges" . Thus, KMS is relevant for opening up SMEs innovation process since OI is about leveraging internal and external knowledge flows to enhance a firm's innovativeness (Chesbrough, 2003).

Once SMEs have acknowledged the relevance of KMS in their journey from closed to open innovation, SMEs develops adapted information and communication technology (ICT) platform (Schubert and Leimstoll, 2008). It consists of transforming explicit and tacit knowledge-types of knowledge present in SMEs-into codified ones that are further shared through ICT platform. Depending on SMEs complexity, goals and objectives, this transformation may require training, benchmarking, sophisticated information technology and a base of trust (Nunes et al., 2006).

4 Method and data collection

The overall research design chosen for the empirical investigation is a case study (Yin, 2003). Firstly, the case study research design, using a qualitative research method, allows for having a more descriptive approach than a quantitative research method (Bryman and Bell, 2007). Thanks to qualitative method, questions, such as, "how and why" rather than "how much", as in a quantitative research method, are answered (Bryman and Bell, 2007; Yin, 2003). Secondly, case-study empirical material can be gathered through interviews, documents, artefacts and observations. Observation is not an exclusive condition when conducting a case-study (Yin, 2003). Thirdly, a case-study allows for a focus on contemporary events (Ibid.). Moreover, as advocated by many researchers, case study research is an efficient method for constructing a rich understanding of complex phenomena (Eisenhardt and Graebner, 2007). In particular, a single-case study design is chosen. This allows us to have an in-depth study of a unique critical case (Yin, 2003).

In order to find this SME, we first browsed the internet and looked for hints of open innovation in SMEs' history. We contacted some SMEs in order to verify whether they recognized some open activities in their innovation process. Not many SMEs recognized this openness. Later on, Björn Remneland-Wikhamn (project leader at openinnovationgbg.se-a blog for the open innovation platform run by researchers from Gothenburg University), during a personal discussion, advised us: "go to any SME and describe the theories and techniques; most probably you will find that some aspects are in place already in the companies"; we did so and utilized Lichtenthaler (2008) Likert-scale questionnaire to measure the extent to which companies were open.

Qualitative study is about trustworthiness rather than truth or value as in quantitative study; implying that method must be transparent and verifiable (Sandelowski, 1993). Consequently, reliability and validity of our study are briefly discussed hereinafter.

Data collection was carried out, firstly, through face-to face interviews. We started by a contact interview where we allowed the interviewee to tell a free story about how they run their product development in order to make sure they were a good case for us. Then, we asked each interviewee separately to talk and tell us their story, tell us if their way of innovating had changed. After that, the interviews were carried out through a semi-structured interview guide inquiring with whom and how they collaborate. During the interviews, the focus was put on our reference framework (corporate culture, networking, organizational structure, knowledge management systems). Secondly, we gathered further information in the company's annual reports in order to cross-check previously collected data (Yin, 2003). All interviews lasted between 30 minutes and one hour; they were recorded and transcribed; a data base was built (Ibid.). E-mail and telephone conversations allowed us to gather missing information. In sum, in order to increase reliability, we collected data through different data collection techniques until it became to be redundant (Bryman and Bell, 2007). In order to increase validity, we triangulated data sources and data collection techniques (Voss et al., 2002) which allowed us to cross-check gathered data. We cross-checked data by confronting all interviews, website information, and annual report information. Firstly, we conceptualized all data based on the four potential barriers. Secondly, within each potential barriers, we conceptualized all data based on Lewin's (1951) organizational change stages. This cross-checking resulted in the creation of the conceptualized table that can be found in appendix I.

5 Case description

Previously, the company produced electrical equipment. About 50 years ago, a manager spotted a product need in the sports market; he went to his boss and asked him to produce this sports equipment. Within a couple of year, he developed this equipment, which was first used at some competitions in Sweden. This product has been a success since then and the sports equipment division of the company split up from the rest of the company. From then on, the company produces the same sports equipment in close collaboration with its users, customers and suppliers in order to innovate and improve the equipment.

Today, the company evolves in the sport equipment industry. More precisely, the company develops weightlifting material, such as, barbells, dumbbells, and weights. The company is located in Sweden and sells its products all around the world; it has a branch in the USA. The company works under a flat structure where decisional power is spread through the CEO and key managers. Moreover, participation to idea generation is encouraged throughout the whole company. The company employs 47 people (based on the 2010 Annual Report) and is composed of eight departments i.e. sales export, sales Scandinavia, sales education, service, marketing, administration and financial, production and logistics, and product development. The company's turnover is SEK 86,569,000 (based on the 2010 Annual Report).

6 Analysis and results

As previously stated, data collected from interviews have been conceptualized in a table according to our reference framework-see appendix I. The studied company, before undertaking the organizational change process, to some extent already gathered complementary technologies from outside, but did not make this outside-in process a strategic asset to develop its products. Consequently, its network, structure and KMS were not adapted to sustain open innovation.

The analysis of each potential barrier is structured following the three different stages-unfreezing, moving, institutionalizing-the company has undergone during the change process.

6.1 Corporate culture

The company started its current activity in sports equipment from a market need. Soon, the company realized that customers and users opinions are a necessity to develop and perpetuate its activity. This feeling of necessity facilitated the awareness of openness importance towards external actors. In other words, necessity in this case is the trigger that helps to avoid the pitfall of acceptance of openness (Mogollon et al., 2010). Equally, the company was aware that it must work hand in hand with suppliers. The product development manager recognizes that they (in the company) know "a little of many things but not the details". Realizing the relevance and importance of the outside-in process (Gassmann and Enkel, 2004) in this case relates to the first phase of cultural change. State of urgency (Kotter, 1996) is created thanks to the feeling of necessity of seeking out technologies outside the organization.

This awareness and acceptance of openness is materialized by the CEO who creates an open climate. The CEO promotes and encourages openness inside and towards the outside of the company. By encouraging employees to hunt for technologies outside the company, the CEO promotes open innovation. Essentially, the CEO shows the way to openness; he integrates employees to decision process, which motivates them; he gives them the means to be open towards the outside through passing his open view-transparency, openness and careful listening to customers-onto them. These crucial steps permit a smooth integration (Ghobadian and Gallear, 1997; Senior and Swailes, 2010) of open mindset-not-invented-here-in the corporate culture. Moreover, the moving phase of corporate culture is made possible through different means. Firstly, the company stimulates visits at exhibitions, conferences, and competitions that permit its employees to gather technologies through face-to-face open dialog with users and customers. Secondly, the company encourages the use of the internet (e.g. Facebook) in order to additionally gather technologies from their customers. Finally, working hand in hand with suppliers is encouraged. This highlights that the company develops means to seek out technologies outside their boundaries and so they become engaged into open innovation activities (Gassmann and Enkel, 2004; Enkel et al., 2009).

In order to anchor open innovation in the company-institutionalizing (Lewin, 1951), the company made openness a strategic asset within and towards the outside of the company. Consequently, the outside-in process is a strategic asset of the company to sustain its competitive advantage (Chesbrough, 2003). In addition of its own ideas, the company scans the market for collecting ideas and needs from customers in order to develop its products. The company meets its users and customers at conferences, exhibitions and competitions; treats its customers as experts and listens to them carefully; completes its information collection and suggestions receipt through the internet [e.g. Facebook (Dufour and Son, 2011)]; and solicits users' and customers' help for product testing. Further in the product development, the company integrates the suppliers. The company shares technology gained from their users and customers with their suppliers in order to innovate hand in hand with them. Furthermore, the company often collaborates with university students and professors for product development. In substance, the company has institutionalized the cultural mindset required in order to sustain outside-in process of open innovation.

In sum, to overcome the potential cultural barrier, the CEO plays a crucial role in terms of creating awareness and instilling the cultural mindset required to sustain open innovation.

6.2 Networking

Once the company had institutionalized the cultural mindset required in order to sustain OI, it had to strive for developing its network (Chesbrough, 2003). The company was aware that having experts at its disposal sustains and enhances firm performance and compensates for a low number of employees. For them, it is a necessity to have experts to help getting work done. Moreover, the company recognized that a network consisting of suppliers, product users and field experts brings in priceless know-how. The product manager says: "the customers have been using the products; they know how the products are supposed to work". Thus, the company is aware that they have in-house knowledge/experts, but in a rather limited number due to its size, and; consequently, these external actors, such as, suppliers, product users and field experts can bring additional technologies to develop products (Chesbrough, 2003; Laursen and Salter, 2006). The company balances the in-house know-how with out-house ones. The company is aware that its best chance to sustain OI is to balance traditional business strategy with open initiatives (Chesbrough and Appleyard, 2007; Chiaroni et al., 2010; Enkel et al., 2009; Pontiskoski and Asakawa, 2009).

In this OI context, once the necessity of enlarging network was recognized, the company took various initiatives to get rid of the networking obstacle (Kotter, 1996). The company's first initiative was to look up among their employees' contacts, and pick up the relevant ones. The company took the CEO and employees' personal networks and moved it to organizational level (Chesbrough, 2003). The company's second initiative was to make the most of product users' and field experts' network to keep this enlarged network growing organically. As a result, the company can directly and/or indirectly benefit from knowledgeable users' networks. The company's third initiative was to have a high rate presence at exhibitions, conferences and competitions, which are places to be in order to enlarge existing networks. The company's fourth and last, initiative was to be present on a platform where questions/answers and suggestions can be exchanged between the company and their customers/users. Consequently, the company created a Facebook page to interact with even more people cost-less (Caloghirou et al., 2004; Ghobadian and Gallear, 1997; Welsh and White, 1981).

Today, one can say that the company succeeded and still succeeds at forming inter-organizational and inter-personal networks that they use so as to enhance their products development. The company has good, long lasting relationships with its suppliers, users and other institutions that can jump anytime into projects if needed (Pontiskoski and Asakawa, 2009). Moreover, the CEO says: "so it is suppliers, users, consultancy, Facebook and then you have employees in the company, so it is a catalogue of people that we use". Through this extended network, the company has built a rather stable network wherein they collect feedback, opinions and suggestions.

In sum, the company is aware that networking brings competitive know-how. To overcome the potential networking barrier, the company aims at refining its network in order to enhance quality through the creation of a valuable list of partners from, which it gathers in additional technology. Accordingly, the company develops its network in order to sustain the outside-in process of open innovation.

6.3 Organizational structure

OI cultural mindset and networking are to be supported by organizational structures that allow the company to absorb external technology and manage it efficiently in-house (Spithoven et al., 2010). Some years ago, the company realized that it should adapt its organizational structure (Hacievliyagil and Auger, 2010) in order to achieve more efficiency and clarity in product development. Up to then, their product

development was carried out "ad hoc" by random people in the organization. Consequently, the company was aware that it needed to adapt its structure in order to centralize all those random technologies existing within and outside the company (Ibid.). The company also realized that product development was a crucial element in order to sustain, consolidate and improve their position on the market (Chesbrough, 2003); the CEO says: "the embryo for that (keeping market position) is of course product development to design the right product. So it is important".

The company enabled itself to support outside-in practices through network's technology absorption; that required creating distinct departments of, which the product development department is the most important one for product innovation and improvement. In effect, creating this department was done through hiring a technical engineer who could centralize and handle technologies coming from other departments and networks (Spithoven et al., 2010); hence, this new department in the company aims at enhancing product development.

As a result of actions taken by the company, the product development department now exists and is run by a knowledgeable, skillful, experienced technical engineer. Now the company contains all departments needed to sustain OI through the outside-in process and grow in its industry. In addition, the different departments, but specifically the product development department, will be filled with more knowledgeable employees; the product development manager says: "I would like to hire more people because I see there are lots of things to do with product development".

In sum, the company is aware that product development is a crucial factor to consolidate its market position. To overcome the potential structural barrier; the company adapts its structure. By doing so, the company efficiently centralizes technologies to benefit from them so as to develop its products. By centralizing in- and out-house technologies, the company efficiently balances and leverages internal technologies with external ones.

6.4 Knowledge management systems

In an OI environment, it is acknowledged that KMS is relevant to identify, exploit and defend existing and acquired technologies (Chesbrough, 2003; Gassmann et al., 2010). In our case, the product development manager acknowledges: "I would like to click on a file and get all the steps in front of me. That would really be good to have all that documents". The company realizes that documenting disparate technologies into structured forms and reports can enhance technology flows within and outside the company; it helps ensuring that no technology is omitted. Moreover, the company is yet aware that risk of crucial technology disclosure is embedded in OI (Harhoff et al. 2003; Hacievliyagil and Auger, 2010) and so that KMS, through confidential agreement and IP protection, can also prevent technology from being stolen. Likewise, the company is aware that not patented products could be copied by others. So state of urgency (Kotter, 1996) is created by the necessity of documenting disparate technology and risks of loss of technology linked to OI (Harhoff et al. 2003; Hacievliyagil and Auger, 2010). This led the company to unfreeze the situation (Lewin, 1951) and to undergo some moves to overcome any previously cited issues.

Once the relevance of KMS has been acknowledged by the company, means can be undertaken to set it up (Schubert and Leimstoll, 2008). In order to enhance technology flows within and outside the company, an engineer was hired to run the product development department. He gathers all data related to product development and has started to digitalize technology collected here and there. He is the central person; other departments (marketing, sales, and education) that also receive and gather technology about products all report to him. The sales manager says: "they (sales

forces) bring all feedback from others to others to the product development manager"; equally the marketing manager says: "if someone hears something somewhere that is wrong or wishes from the customers, they go to the product development manager". Thus, the company has started the process of critically managing technology (Nunes et al., 2006) from rather informal procedures to more formalized ones. Moreover, the company created a confidential agreement form to be used when launching collaborative product development with suppliers. Likewise, the company takes advantage of Facebook to receive suggestions and gather technologies in a more formalized procedure and, in some cases, it writes down formal reports after meetings with suppliers. Nevertheless, due to the company's size and the nature of exchanged technology, structured reports and IP management are still far from being routine. Consequently, it can be said that KMS has not been institutionalized yet (Lewin, 1951), which means that the company can yet increase its degree of OI.

So far, the company still finds it manageable to have rather informal procedures even though some steps have been undertaken to prevent KMS from being a barrier (Lee et al., 2010; Mogollon et al., 2010; Ramos et al., 2009; van de Vrande et al., 2009) for the company's future and expanding activities. Consequently, this part is discussed further in the managerial implication section.

7 Conclusions and discussion

The purpose of this article is to answer the following research question: "How do SMEs try to overcome the organizational and cultural barriers when evolving from closed to open innovation?" In order to answer the research question an in-depth case study involving an SME active in mature sports equipment industry has been carried out. SMEs are usually committed in collaborating through forming alliances to share risks, gather complementary competencies and create synergies (Lee et al., 2010). OI takes place in an open business environment but an open business environment is not always OI (Chesbrough, 2007). Consequently, even though SMEs evolve more often in an open environment, they need to undertake changes so as to sustain OI. In order to cope with increasing products and technologies complexity, SMEs engaged in OI purposely collaborate openly with users/suppliers/partners to innovate and to remain competitive. Thanks to our analysis the following conclusions are drawn.

To overcome the four potential barriers-corporate culture, networking, organizational structure, and KMS-the studied SME has taken various measures. First, The CEO plays a key role in preventing the corporate cultural barrier. The CEO creates awareness and instills the cultural mindset required to sustain OI by making openness a strategic asset within and towards the outside of the SME. This finding is in line with Ghobadian and Gallear (1997) argue that managers in SMEs are responsible for the many facets of the enterprise and many decisions. As a result, the CEO is the main catalyst for overcoming the cultural barrier. Second, integrating users, suppliers, and partners in a network is a popular practice among SMEs (Gassmann, 2006; van de Vrande et al., 2009). This integration is facilitated by SMEs' organic structure (Ghobadian and Gallear, 1997; Lee et al., 2010). Nonetheless, in order to prevent the networking barrier, the SME aims at refining its network to enhance quality through the creation of a valuable list of partners from, which it gathers in additional technology. This result goes along with Pontiskoski and Asakawa (2009) who recommend having a good, long lasting relationship with its suppliers, users and other institutions that can jump anytime into projects if needed. Third, product development is a crucial factor for the SME. In order to overcome the organizational structural barrier, the SME created a product development department that integrates and handles technologies received through its network. This matches Hacievliyagil and

Auger (2010) and Spithoven et al. (2010) who argue that structural adaptation allows the company to absorb external technologies and manage them efficiently in-house. Fourth, the SME has started the process of critically managing technology (Nunes et al., 2006) from rather informal procedures to more formalized ones. However, due to the SME's size, small customers', suppliers' and partners' base, and the nature of exchanged technology, structured reports and IP management are still far from being routine. This result is supported by van de Vrande et al. (2009) who claim that SMEs develop practices to interact with users, suppliers and partners in unstructured and informal manners.

Based on our conclusion, we claim that the SME is involved into OI to some extent, mainly in the outside-in processes. The SME taps into knowledge of users/suppliers/partners outside its company's boundaries to complement its internal knowledge. The SME balances internal and external R&D. The SME takes advantage of users/suppliers/partners technologies. The SME carefully plans its business model by making OI a strategic asset. The SME balances internal and external technologies.

Nevertheless, the SME has not taken advantage of the inside-out perspective and others´ use of its IP yet, as well as, not taken advantage of others' IP. The latter does not disqualify the SME from being engaged into OI. Since Chesbrough et al. (2006) OI definition remains vague and wide and that Gassmann and Enkel (2004) argue that OI exists through three different processes, we claim that OI can take different forms and can appear at several degrees within an OI holistic view. We also claim that even though several degrees of OI can exist, it remains essential to carry out research considering all aspects of OI, as we did in this study. This is further discussed in the last section. In addition, we argue that the manner the SME implements OI is inherent to its intrinsic characteristics. However, for the sake of the SME, managerial implications are developed in the following section providing recommendations to improve the ways the SME sustains OI and balances OI to a relevant level.

7.1 Managerial implications

The studied SME has a strong market position. It can be said that this strong market position has been enhanced thanks to OI, which goes along with previous studies (e.g. Chesbrough, 2003). Consequently, the SME is recommended to nurture its approach to OI. Meanwhile, Enkel et al. (2009, p. 312) argue that "too much openness can negatively impact companies' long-term innovation success, because it could lead to loss of control and core competences". However, we believe that the SME must not be afraid to engage itself into more OI practices since it possesses confidential agreement on its core competence and has a strong brand image, which is difficult to usurp. Following, few recommendations are made.

Firstly, the SME realized that its network-users, suppliers, and partners-is its primary source of innovative ideas. Nevertheless, the SME needs to bear in mind previous research on the extent to which a firm is recommended to rely on its network. By using open search strategy, the SME will remain more innovative than others, but open search strategy is costly. Consequently, at a certain point openness can negatively influence the SME's innovation performance. As a result, relying too much on external sources and search channels is time consuming, laborious and too expensive compared to resulting benefits for the SME.

Secondly, as previously stated, the SME has not fully developed its KMS yet. In order to get the most of its interaction with its network, the SME is advised to formalize its procedures. So far, the SME formalized the manner it centralizes gathered in technologies. But the procedure to gather technology from network is recommended to be formalized for various reasons. For instance, it helps to ensure that no information is missed and/or disregarded, it helps to enhance the flow of gathered-in

technologies and it helps to keep structured traces of gained technologies. This can be done by developing semi-structured forms where most frequently debated topics are stated, but it remains primordial in an OI approach to leave space for network to express itself. Moreover, in order to protect its innovation works, the SME is advised to systematically have recourse to confidential agreement with its suppliers on the one hand. On the other hand, the SME is recommended to train its field employees what can be disclosed to users, customers and partners and what cannot be disclosed.

Thirdly, and based on the abovementioned recommendation, an OI approach can be differentiated between the SME departments. Since different departments-e.g. marketing department VS product development department-have different goals and deliverables, it seems accurate to adopt suited approaches to OI. For instance, the product development department could have its own tool to integrate further its network in product development. The idea would be to provide the network with a tool allowing it to freely think/reflect on how it would prefer sports equipment to look like. Likewise, the marketing department could ask users how they like their sports equipment and promote the SME's sports equipment through users' stories. Nonetheless, the SME has to bear in mind that too formalized approaches would decrease the benefits of OI. This paragraph presented some hints on how to nurture OI; however, these hints are neither exclusive nor exhaustive, so the SME is recommended to use its creativity to develop additional ideas to nurture its OI approach.

Finally, the SME is engaged in outside-in process, which is one of the three processes of OI. The outside-in process mainly consists of seeking out technologies outside of the organization. Another process of OI, called inside-out process, consists of selling out technologies. Basically, the SME, if engaged in inside-out process, would sell its know-how in order to enlarge its resources pool. As a remark, the last process of OI consists of combining outside-in and inside-out process, namely coupled process.

7.2 Discussion and future research

Based on our analysis and results and conclusion, we claim that some interesting angles could be further investigated through future research.

Firstly, a quantitative study based on our results would be useful to confirm our research outcomes. The quantitative study would apply to a large sample and test whether the different means to overcome organizational and cultural barriers when evolving from closed to open innovation found in this paper can be generalized. Then, we may see trends arising and consequently build some roadmap for SMEs to overcome organizational and cultural barriers when evolving from closed to open innovation.

Secondly, as we can see in the previous sections, the SME is involved into OI. But, as claimed in this paper, the SME can still nurture its OI approach. For example, the SME has a clear network project initiative and even to some extent uses its network in its product development; but, the product development department could have its own tool to integrate further its network in product development. Moreover, the SME is engaged in the outside-in process of OI; in the future, the SME could take more advantage of the inside-out process of OI.

According to us, this makes it relevant to discuss the degree of OI that can exist between extremely closed innovative companies and extremely open innovative companies, since we claim that companies can evolve between those two extremes. In order to measure the degree of OI, academics have to determine relevant criteria. For instance, Laursen and Salter (2006) elaborated two variables allowing a company network to be measured in term of breadth/depth. Moreover, Lichtenthaler (2008) developed a seven points Likert-type scale to measure firm's degree of openness.

Furthermore, this research would require refining Chesbrough et al.'s (2006) definition of OI, because it is vague and wide, and, as a consequence, allows too much interpretation. These two models combined with a refined definition of OI would give avenues for this research. This research could use quantitative research strategy applying developed criteria to a large sample of companies.

Thirdly, in our analysis, we could identify that the SME formalized some procedures, which is required to gather in technology efficiently. One could wonder whether over-formalization would hinder OI performance since OI stresses the importance of a certain level of laissez-faire. Consequently, research could be carried out on the degree of formalization and its influences on OI performance. This research would require quantitative research strategy applying the concepts of degree of formalization and OI performance to a large sample of companies. A similar study on 164 large Spanish firms has been carried out by Pertusa-Ortega et al. (2010) on the degree of formalization and knowledge performance, but no empirical evidence was found to support this hypothesis. In sum, due to the recent nature of this study and our research proposal, a literature gap in the degree of formalization and its influences on knowledge management is highlighted.

Fourthly, as we emphasize in our conclusion and as Ghobadian and Gallear (1997) state, the CEO in SMEs is responsible for the many facets of the enterprise and many decisions. Consequently, in SMEs the CEO can be either the main catalyst for change or the main stumbling block to change. Moreover, SMEs are dominated by pioneers and entrepreneurs. As Heirman and Clarysse (2004) argue pioneers' and entrepreneurs' values, goals, and skills shape their willingness to keep control over their SMEs. Likewise, Enkel et al. (2009) argue that the more a firm is engaged in OI, the more the risk of losing control over firm increases. As a result, this makes it relevant to us to study the influence that CEOs' willingness to keep control over their SMEs has on the extent to which CEOs are willing to engage into OI.

Fifthly, our study allows understanding on how SMEs try to overcome the organizational and cultural barriers when evolving from closed to open innovation. In addition, it could be interesting to study whether these potential barriers are overcome in a sequence of moves or whether these moves overlap each other. This might sound rather practical, but might be relevant to help SMEs' managers to implement OI successfully.

Sixthly, previous studies demonstrate the existence of barriers that firms face when evolving from closed to open innovation. Moreover, empirical studies indicate how firms overcome these barriers. Nevertheless, questions still subsist on how SMEs "can identify, plan and manage a pilot project so as to unfreeze the status quo and prepare the ground for a successful shift toward Open Innovation" (Boscherini et al., 2010, p. 1065). This means to study what happens before SMEs attempt to shift from closed to open innovation as Boscherini et al. (2010) studied for large firms.

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9 References

Aguero, C., & Sanchez, P. (2010). Intellectual capital and knowledge management in collaborative networks. *In the Proceedings of the 2nd European conference on intellectual capital*, 1-9.

Allio, R. J. (2005). Interview with Henry Chesbrough: innovating innovation. *Strategy & Leadership*, *33*(1), 19-24.

Ansoff, I. (1965). *Corporate Strategy*. New York: McGraw-Hill.

Aylen, J. (2010). Open versus closed innovation development of the wide strip mill for steel in the United States during the 1920s. *R&D Management*, *40*(1), 67-80.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99-112.

Bianchi, M., Campodall'Orto, S., Frattini, F., & Vercesi, P. (2010). Enabling open innovation in small-and medium-sized enterprises: How to find alternative applications for your technologies. *R&D Management*, *40*(4), 414-431.

Boscherini, L., Chiaroni, D., Chiesa, V., & Frattini, F. (2010). How to use pilot projects to implement Open Innovation. *International Journal of Innovation Management*, *14*(6), 1065-1097.

Bryman, A. & Bell, E. (2007). *Business research methods (2nd edition)*. New York: Oxford University Press Inc.

Burns, T., & Stalker, G. M. (1966). *The management of innovation* (2nd edition). London: Tavistock Publishing.

Caloghirou, Y., Kastelli, I., & Tsakanikas, A. (2004). Internal capabilities and external knowledge sources: complements or substitutes for innovative performance? *Technovation*, *24*(1), 29-39.

Cantner, U., Conti, E., & Meder, A. (2009). Networks and innovation: the role of social assets in explaining firms' innovative capacity. *Jena Economic Research Papers*, 40, 1-22.

Chesbrough, H. (2007). Business model innovation: it's not just about technology anymore. *Strategy & Leadership*, *35*(6), 12-17.

Chesbrough, H. W. (2003). The era of open innovation. *Sloan Management Review*, *44*(3), 35-41.

Chesbrough, H., & Appleyard, M. (2007). Open Innovation and Strategy. *California Management Review*, *50*(1), 57-76.

Chesbrough, H., & Crowther, A.K. (2006). Beyond high tech: Early adopters of open innovation in other industries. *R&D Management*, *36*(3), 229-236.

Chesbrough, H., Vanhaverbeke, W., & West, J. (2006) *Open Innovation: Researching a New Paradigm*. Oxford: Oxford University Press.

Chiaroni, D., Chiesa, V., & Frattini, F. (2010). Unravelling the process from closed to open innovation: Evidence from mature, asset-intensive industries. *R&D Management*, *40*(3), 222-245.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128-152.

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics. *Journal of Management*, *17*(1), 121-154.

Dufour, J., & Son, P.-E. (2011). Opening up the innovation process in SMEs: what can be learnt from studies on MNEs? *Frontiers in Research on Management of*

Innovation and Business Development, forthcoming.

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from case studies: opportunities and challenges. *Academy of Management Journal*, *50*(1), 25-32.

Elmquist, M., Fredberg, T., & Ollila, S. (2009). Exploring the field of open innovation. *European Journal of Innovation Management*, *12*(3), 326-345.

Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and open innovation: exploring the phenomenon. *R&D Management*, *39*(4), 311-316.

EU Commission (2005). *The new SME definition-User guide and model declaration. Enterprise and industry publications*. Accessed 28th November 2010 from the EU Commission Website:

Gassmann, O. (2006). Opening up the innovation process: towards an agenda. *R&D Management*, *36*(3), 223-228.

Gassmann, O., & Enkel, E. (2004). Towards a theory of open innovation: three core process archetypes. *In the Proceedings of the R&D Management Conference*, Lisbon, Portugal, July, 6-9.

Gassmann, O., Enkel, E., & Chesbrough, H. (2010). The future of Open Innovation. *R&D Management*, 40(3), 2013-221.

Ghobadian, A., & Gallear, D. (1997). TQM and organization size. *International Journal of Operations & Production Management*, *17*(2), 121-163.

Groen, A. J., & Linton, J. D. (2010). Is open innovation a field a study or a communication barrier to theory development? *Technovation, 30*(11), 554.

Hacievliyagil, N. K., & Auger, J.-F. (2010). What does open innovation implies for the management of R&D? The cases of two multinational firms. *Strasbourg: Bureau d'économie théorique et appliquée, Université de Strasbourg*, 1-7.

Hagedoorn, J. (1993). Understanding the rationale of strategic technology partnering: inter-organizational modes of cooperation and sectoral differences. *Strategic Management Journal*, *14*(5), 371-385.

Hagedoorn, J. (2002). Inter-firm R&D partnerships: an overview of major trends and patterns since 1960. *Research Policy*, *31*(4), 477-492.

Hagedoorn, J., & Duysters, G. (2002). External sources of innovative capabilities: the preferences for strategic alliances or mergers and acquisitions. *Journal of Management Studies*, *39*(2), 167-188.

Hamel, G. (1991). Competition for competence and inter-partner learning within international strategic alliances. *Strategic Management Journal*, *12*(4), 83-103.

Harhoff, D., Henkel, J., & von Hippel, E. (2003). Profiting from voluntary information spillovers: How users benefit by freely revealing their innovations. *Research Policy*, *32*(10), 1753-1769.

Heirman, A., & Clarysse, B. (2004). How and why do research-based start-ups differ at founding? A resource-based configurational perspective. *The Journal of Technology Transfer*, *29*(3-4), 247-268. Accessed 2011.

http://ec.europa.eu/enterprise/policies/sme/files/sme_definition/sme_user_guide_en.pdf

Huizingh, E. K. (2010). Open innovation: State of the art and future perspectives. *Technovation*, *31*(1), 2-9.

Huston, L., & Sakkab, N. (2006). Connect and develop: Inside Procter&Gamble's new model for innovation. *Harvard Business Review*, *86*(3), 58-66.

Katz, R., & Allen, T. J. (1982). Investigating the Not Invented Here (NIH) syndrome: A look at the performance, tenure, and communication patterns of 50 R&D

Project Groups. *R&D Management*, *12*(1), 7-20.

Kotter, J. P. (1996). *Leading change*. Cambridge: Harvard Business School Press.

Laursen, K., & Salter, A. (2006). Open innovation: the role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal*, *27*(2), 131-150

Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs: an intermediated network model. *Research Policy*, *39*(2), 290-300.

Lewin, K. (1951). *Field Theory in Social Sciences*. New York: Harper & Row.

Lichtenthaler, U. (2008). Open innovation in practice: an analysis of strategic approaches to technology translations. *IEEE Transactions on Engineering Management*, *55*(1), 148-157.

Mogollon, R., Cepeda-Carrión, G., Cegarra-Navarro, J. G. & Leal-Millán, A. (2010). The role of cultural barriers in the relationship between open-mindedness and organizational innovation. *Journal of Organizational Change Management*, *23*(4), 360-376.

Nunes, M. B., Annansingh, F., Eaglestone, B., & Wakefield, R. (2006). Knowledge management issues in knowledge-intensive SMEs. *Journal of Documentation*, *62*(1), 101-119.

Pertusa-Ortega, E. M., Zaragoza-Saez, P., & Claver-Cortes, E. (2010). Can formalization, complexity and centralization influence knowledge performance? *Journal of Business Research*, *63*(3), 310-320.

Piller, F.T. & Walcher, D. (2006). Toolkits for idea competitions: A novel method to integrate users in new product development. *R&D Management*, *36*(3), 307-318.

Pontiskoski, E., & Asakawa, K. (2009). Overcoming Barriers to Open Innovation at Apple, Nintendo and Nokia. *In the Proceedings of World Academy of Science, Engineering and Technology*, *53*, 372-377.

Ramos, I., Cardoso, M., Carvalho, J. V., & Graça, J. I. (2009). An action research on open knowledge and technology transfer. *IFIP Advances in Information and Communication Technology*, 301, 211-223.

Rundquist, J., & Halila, F. (2010). Outsourcing of NPD activities: a best practice approach. *European Journal of Innovation Management*, *13*(1), 5-23.

Sandelowski, M. (1993). Rigor or rigor mortis: the problem of rigor in qualitative research revisited. *Advances in Nursing Science*, *16*(2), 1-8.

Senior, B., & Swailes, S. (2010). *Organizational Change* (4th edition). Harlow: Pearson Education Limited.

Spithoven, A., Clarysse, B., & Knockaert, M. (2010). Building absorptive capacity to organize inbound open innovation in traditional industries. *Technovation*, 30, 130-141.

Teece, D. J. (2000). Strategies for managing knowledge assets: The role of firm structure and industrial context. *Long Range Planning*, *33*(1), 35-54.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509-533.

Trott, P., & Hartmann, D. (2009). Why 'open innovation' is old wine in new bottles. *International journal of Innovation Management*, 13(04), 715-736.

van de Vrande, V., de Jong, J. P. J., Vanhaverbeke, W., & de Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*, 29(6), 423-437.

von Hippel, E. (1978). Successful industrial products from customer ideas. *Journal of*

Marketing, *42*(1), 39-49.

von Hippel, E. (1986). Lead users: a source of novel product concepts. *Management Science*, *32*(7), 791-805.

von Hippel, E. (1988). The sources of innovation. *Research Policy*, *18*(5), 297-297.

von Hippel, E., & Katz, R. (2002). Shifting innovation to users via toolkits. *Management Science*, *48*(7), 821-883.

von Hippel, E., & von Krogh, G. (2003). Open source software development and the private-collective innovation model: issues for organization science. *Organization Science*, *14*(2), 208-223.

von Hippel, E., & von Krogh, G. (2006). Free revealing and the private-collective model for innovation incentives. *R&D Management*, *36*(3), 295-306.

Voss, C., Tsikriktsis, N., & Frohlich, M. (2002). Case research in operations management. *International Journal of Operations & Production Management*, *22*(2), 195-219.

Welsh, J.A., & White, J.F. (1981). A small business is not a big business. *Harvard Business Review*, *59*(4), 18-32.

Yin, R. K. (2003). *Case Study Research: Design and Method* (3rd edition). Thousand Oaks: Sage Publications.

Zahra, S.A., & Filatotchev, I. (2004). Governance of the Entrepreneurial Threshold Firm: A Knowledge-based Perspective. *Journal of Management Studies*, *41*(5), 885-897.

10 Appendix

Company background		Unfreezing	Moving	Institutionalizing
Previously, the company produced electrical equipment. About 50 years ago, a manager spotted a product need in the sports market; he went to his boss and asked him for producing this sports equipment. Within a couple of year, he developed this equipment, which was first used at some competitions in Sweden. This product has been a success since then and the sports equipment division of the company split up from the rest of the company. From then on, the company produces the same sports equipment in close collaboration with its users, customers, and suppliers in order to innovate and improve the equipment.	Corporate culture	From the beginning, the company's activity stemmed from a market need. The CEO recognizes that the culture is the most important element in order to be opened. In addition, he says that it is his job as a leader to instill that open mindset to his employees. The company recognizes that it depends on customers' opinion, feedback, and expertise (technologies). Moreover, the company is aware that customers' integration is essential to their business. The company recognizes that suppliers are the most knowledgeable actors to help it developing physical products. The product development manager recognizes that they (in the company) know "a little of many things but not the details".	The company's CEO promotes openness inside the company, as well as, towards the outside of the company. He sees openness as an important element of the company development. He also integrates his employees in decision processes in order to motivate them. Transparency, openness, and careful listening to customers are encouraged. The company also tries to have open dialogs with its customers. The company encourages its employees to take feedback and criticism from customers (technologies) through their networks; through visits at exhibitions, conferences, and competitions; through their sales forces; and through their education department. In addition, the company uses the internet (e.g. Facebook) and magazines in order to gather opinions, suggestions, answers to questions, and trends i.e. technologies. The company encourages working hand in hand with suppliers for product development.	The company has made openness (OI) a strategic asset within and towards the outside of the company. The company generates its own ideas but also importantly searches the market for getting ideas and needs (technologies) from customers. The company has an open approach towards their customers and treats them as experts because they use their product all year long. They listen carefully to what they say, think, and want. The company's employees go and meet customers in person at exhibitions and competitions, as well as at their own education center and when visiting them during sales. The company also uses its customers as experts in order to test their new products. In addition, the company gathers customers' opinions and suggestions (technologies) on the internet (e.g. Facebook). The company follows trends by searching the internet and specialized magazines. The company mainly collaborates with suppliers for physical product development. The company is the link between customers' ideas and need, and product development in collaboration with suppliers. The product development manager says: "we try to break down problem we got from our customers with our suppliers". In addition, the company often collaborates with university students and professor for product development; the CEO says: "in product development, we have had a lot of students here, and we can also go higher up in the hierarchy and find help from professor".
	Networking	The company is aware that it is important to get the right persons to get work done. The company knows that a good network of customers brings it unbeatable expertise. The product development manager says: "the customers have been using the products; they know how the products are supposed to work".	The company first seeks for contacts within the company; that is, employee's contacts are the first networks utilized when suppliers and/or users' expertise are needed. The company has a high rate presence at exhibitions, conferences, and competitions. The product development manager says: "That is one way to get into contact with good expertise". The company enjoys directly and/or indirectly highly knowledgeable users'	The company has made its list of potential partners to jump in projects. The CEO says: "so it is suppliers, users, consultancy, Facebook and then you have employees in the company, so it is a catalogue of people that we use". The company has built a rather stable users network that helps it through feedback, and testing (technologies). The company uses the internet (e.g. Facebook) in order to frequently keep in touch with users. The company has good, long-lasting relationship with its suppliers and other institutions; the CEO says: "we have good connections with steel industry here in Sweden" and "we are in contact with a company that belongs to the Swedish state

Company background		Unfreezing	Moving	Institutionalizing
	Networking	The company is aware that it is important to get the right persons to get work done. The company knows that a good network of customers brings it unbeatable expertise. The product development manager says: "the customers have been using the products; they know how the products are supposed to work".	The company first seeks for contacts within the company; that is, employee's contacts are the first networks utilized when suppliers and/or users' expertise are needed. The company has a high rate presence at exhibitions, conferences, and competitions. The product development manager says: "That is one way to get into contact with good expertise". The company enjoys directly and/or indirectly highly knowledgeable users' networks. The company uses the internet (e.g. Facebook) in order to reach more people with their question and for suggestions.	The company has made its list of potential partners to jump in projects. The CEO says: "so it is suppliers, users, consultancy, Facebook and then you have employees in the company, so it is a catalogue of people that we use". The company has built a rather stable users network that helps it through feedback, and testing (technologies). The company uses the internet (e.g. Facebook) in order to frequently keep in touch with users. The company has good, long-lasting relationship with its suppliers and other institutions; the CEO says: "we have good connections with steel industry here in Sweden" and "we are in contact with a company that belongs to the Swedish state that is specialized in testing product".
	Organizational structure	Some years ago, the company recognized that its product development was carried out "ad hoc" by random people in the organization. The CEO says: "we had a type of product development before but it was not as structured as now, and it was less systemized than how we are doing now". The company recognized that for sustaining its position on the market, product development was a crucial element; the CEO says: "the embryo for that (keeping market position) is of course product development to design the right product. So it is important".	The company decided to hire educated people; the marketing manager says: "that's the evolution, to have well educated people and have enough of them". The company decided to hire a technical engineer to be in charge of the new product development department.	The product development department now exists and is run by a knowledgeable, skilful, experienced technical engineer. Now the company contains all departments needed to sustain OI and growth. In addition, the different departments but specifically the product development department will be filled with more knowledgeable employees; the product development manager says: "I would like to hire more people because I see there are lots of things to do with product development".
	Knowledge Management systems	The product development manager acknowledges that it would be of great importance to have all knowledge digitalized; he says: "I would like to click on a file and get all the steps in	In order to increase formalization of knowledge in the company and especially in product development, the company hired an engineer who runs the product development department. He gathers all technologies related to product	(FUTURE) The company might be planning on formalizing interactions with customers through official pre-existing reports. The company might be thinking of signing confidentiality agreements with all suppliers

Company background		Unfreezing	Moving	Institutionalizing
	Knowledge Management systems	The product development manager acknowledges that it would be of great importance to have all knowledge digitalized; he says: "I would like to click on a file and get all the steps in front of me. That would really be good to have all that documents". In addition, the company realizes that formalized reports should be used rather than tacit knowledge. For instance, the company realizes that formal reports should accompany face-to-face interactions with users and suppliers in order to make everything more formal. The company is not afraid of confidentiality towards users and customers. However, they acknowledge that evil-minded customers or users could steal information and they are aware of that. The company is aware of the fact that suppliers could steal their ideas and their collaborative development works. Consequently, they are aware that even though they work with local suppliers, gentlemen's agreements are not enough anymore. The company is aware that their not patented products could be	In order to increase formalization of knowledge in the company and especially in product development, the company hired an engineer who runs the product development department. He gathers all technologies related to product development and has started to digitalize tacit knowledge (technologies) that is there and there in the company. He is the central person; other departments (marketing, sales, and education) that also receive information about products all report to him. The sales manager says: "they (sales forces) bring all feedback from others to others to the product development manager"; equally the marketing manager says: "if someone hears something somewhere that is wrong or wishes from the customers, they go to the product development manager". However, formalized reports still not exist in the company. Overall, due to the size of the company and the nature of exchanged information, the company's employees find it still manageable to have rather informal interactions and reports. The company uses the internet (e.g. Facebook) in order to integrate even more customers and users to product development. This is also a more formalized procedure to gather feedback, opinions, and suggestions. The company writes formal reports for some meetings with suppliers but not in most cases. The company does not disclose crucial information to users and customers; they	(FUTURE) The company might be planning on formalizing interactions with customers through official pre-existing reports. The company might be thinking of signing confidentiality agreements with all suppliers The company might question itself about patents.

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Green start-ups – a new typology for sustainable entrepreneurship and innovation research

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Abstract. There is a growing political consensus about the necessity to decouple economic growth from environmental impacts. For a transition towards a green economy radical innovation plays a central role. Start-ups are key market actors in the development and market introduction of radical sustainable innovation, but so far there is little research on the specific challenges and opportunities of green start-ups. In this conceptual paper, we bring together research and theory on entrepreneurship and innovation as well as sustainable business practice and ask why and how different types of green start-ups may encounter specific financing challenges and opportunities when developing their products/services. As existing typologies are too unspecific to properly explain the financing challenges and opportunities of green start-ups, we elaborate on these and develop a new typology of green start-ups. This typology will enable further empirical exploration of specific challenges and opportunities that such start-ups have when looking for finance.

Keywords. Sustainable Innovation, Sustainable Entrepreneurship, Green Start-ups, Typology, Entrepreneur, Strategy, Green Products and Services, Finance.

1 Introduction

There is growing political consensus about the necessity to green the economy and to decouple economic growth from environmental impacts (OECD, 2011). A greening of the economy requires a strategy for sustainable transitions and fundamental changes in production and consumption patterns (UNEP, 2011). One key element in the facilitation and management of the multilevel challenge of sustainable transitions (Geels, 2010a) is the development, implementation, and diffusion of radically new or significantly improved products (goods or services), processes, or practices, which reduce the use of natural resources and decrease the release of harmful substances across the whole life cycle (EIO, 2013, p. 2). Thus, sustainable innovation and its diffusion are considered to be a key in any strategy for a societal transformation process toward sustainable development and a green economy.

Recent empirical results underline the necessity to make a distinction regarding the type of organisation that develops and implements sustainable product or service innovations: Start-ups and new companies are evidently the key market actors in the development and market introduction of radical sustainable innovation, while incremental innovation tends more to be the turf of established companies (Fichter and Weiß, 2013). From this it can be inferred that "green" start-ups, which develop and implement products or services that contribute to the goals of a green economy (reducing greenhouse gas emissions, improving energy efficiency, adopting a circular economy approach etc.), should be a major

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concern in innovation and environmental policy. But so far rather little is known about the specific challenges green start-ups are facing. Especially the financing of green start-ups could be substantially different from the financing of more conventional start-ups (cf. Shepherd and Patzelt, 2011). There have been calls for more research in this area (Shepherd and Patzelt, 2011; Nicholls and Pharoah, 2008).

Further research exploring the specific financing challenges and opportunities of green start-ups needs to take into account that entrepreneurs, product and services and market and institutional environments are very diverse. The diversity of start-ups and operating environments has an influence on the type and degree of financing challenges and opportunities experienced. For this reason, it is essential to base further empirical investigations on a sound typology of green start-ups, which allows a proper description and explanation of financing challenges and opportunities.

Against this backdrop, the purpose of this paper is to investigate existing typologies of sustainable entrepreneurship, to analyse the extent to which they are suited to serve as a foundation for empirical research on financial challenges in green start-ups and – if not entirely suitable – to develop an appropriate typology. Building on a typology framework, we can more accurately and explicitly explore the potential impact of individual characteristics on specific challenges and opportunities that such start-ups have in an everyday business context and especially when it comes to looking for finance. The aim of this conceptual paper is thus to provide a foundation for future empirical work in such specific contexts.

2 Literature review

2.1 Sustainable innovation

Sustainability-related innovation and technology studies have received increasing attention over the past 10 to 15 years (Markard et al., 2012, p. 955). The importance of sustainable innovation management is described as growing both in practice and in academia (Schiederig et al., 2012). What exactly is meant by "sustainable innovation"? Numerous terms to describe similar phenomena have been used widely in academia. The key terms used since the mid-1990s include "environmental innovation" and "eco-innovation" (Fussler, 1996; Rennings, 2000; Kemp and Pearson, 2007; OECD, 2009; Horbach et al., 2012), "sustainability innovation" (Fichter and Pfriem, 2007; Arnold and Hockerts, 2010), "sustainable innovation" (Wüstenhagen et al., 2008; Nill and Kemp, 2009; Hockerts and Wüstenhagen, 2010), "sustainability-oriented innovation" (Klewitz and Hansen, 2014), and "green innovation" (Schiederig et al., 2012). While a distinction between environmental and social issues related to innovation is often made, a clear line is rather difficult to draw. A recent analysis of 8,516 journal publications shows that "40.7% (3,469) apply the notion 'environmental innovation', 31.9% (2,716) the notion 'sustainable innovation', 17.6% (1,495) 'eco-innovation' and 9.8% (836) the notion 'green innovation'. It appears that more than 80% of the publications use only one notion, indicating that the notions are used consistently within individual publications" (Schiederig et al., 2012, p. 183). The analysis further shows that three different concepts of green, ecological, and environmental innovation are used largely synonymously, while the notion of sustainable innovation broadens the concept and includes a social dimension.

There has been a rich debate in the economic literature about the distinctive features of environmental innovation and eco-innovation as opposed to general innovation (Rennings, 2000). One of the most referenced definitions is provided by Kemp and Pearson (2007, p. 7): "Eco-innovation is the production, application or exploitation of a good, service, production process, organizational structure, or management or business method that is novel to the firm or user and which results, throughout its life cycle, in a reduction of environmental risk, pollution and the negative impacts of resource use (including energy use) compared to relevant alternatives". The EU-funded Eco-Innovation Observatory (EIO) describes eco-innovation as "any innovation that reduces the use of natural resources and decreases the release of harmful substances across the whole life-cycle" (EIO, 2013, p. 10). This relatively broad definition builds on a dominant understanding of innovation and further emphasises types of inputs, outputs and full life-cycle impact as the key indicators of eco-innovation. Concepts of sustainable or sustainability innovation include these environmental aspects as a key feature, but also explicitly claim that radically new or significantly improved products (goods or services), processes or practices contribute to economic and social goals of sustainable development (Wüstenhagen et al., 2008). Rather than just focusing on short-term profits, stakeholders expect firms to meet a triple bottom line of economic, environmental, and social value creation (Elkington, 1999; Schaltegger and Wagner, 2011). Building on then existing literature, Fichter (2005) defines sustainable innovation as "the development and implementation of a radically new or significantly improved technical, organisational, business-related, institutional or social solution that meets a triple bottom line of economic, environmental and social value creation. Sustainable innovation contributes to production and consumption patterns that secure human activity within the earth's carrying capacities" (Fichter, 2005, p. 138, authors' translation). In this paper, we will adopt this concept of "sustainable innovation." Examples of existing sustainable innovation include organic and fair food production, electric and shared mobility, sustainable fashion, renewable energy technology, energy-efficient "smart homes" and eco-tourism.

2.2 Sustainable entrepreneurship

Sustainable entrepreneurship is "[...] an innovative, market-oriented and personality driven form of creating economic and societal value by means of break-through environmentally or socially beneficial market or institutional innovations" (Schaltegger and Wagner, 2011). It creates economic value through market activity and societal value through positive externalities or a reduction of negative externalities. Unlike public, charitable or NGO activity with a societal impact, sustainable entrepreneurship – as it takes place in a business context – needs to be financially self-sustaining in the middle to long-term (cf. Shepherd and Patzelt, 2011; Thompson et al., 2011).

Using the above definition of sustainable entrepreneurship as a starting point, it can be argued that research on it overlaps with a wide range of theory and research on sustainable business practises, such as e.g. environmental management, business ethics, stakeholder theory and CSR (Corporate Social Responsibility). The distinction of sustainable entrepreneurship from other similar types of entrepreneurship such as social entrepreneurship and environmental entrepreneurship (/ecopreneurship) is still an issue of contention (cf. Schaltegger and Wagner, 2011; Thompson et al., 2011). Here, we see sustainable entrepreneurship as a specific form of entrepreneurship that meets a triple bottom line of economic, environmental and social value creation by means of sustainable innovation.

Sustainable entrepreneurship is a relatively new research area within the larger field of

entrepreneurship research (Thompson et al., 2011; Cohen and Winn, 2007) and a great deal of research on it to date has been conceptual. Several studies attempt to define sustainable entrepreneurship (Schaltegger and Wagner, 2011; Shepherd and Patzelt, 2011; Thompson et al., 2011) or broaden the understanding of wealth creation (Di Domenico et al. 2010; Tilley and Young, 2009) and opportunity development (Doyle Corner and Ho, 2010). Others explore the entrepreneurial opportunities and challenges arising through the existence of externalities and market inefficiencies (Pacheco et al., 2010; Patzelt and Shepherd, 2011; York and Venkataraman, 2010; Cohen and Winn, 2007; Dean and McMullen, 2007) or evaluate the potential societal impact of the resulting innovation (Cohen et al., 2008; Schaltegger, 2002). A few studies focus on strategic issues, such as the entrepreneurial process (Belz and Binder, 2015), the competitive strategy of the entrepreneurs (Petersen, 2003) or the potential necessity of sustainable entrepreneurs to become institutional entrepreneurs in order to achieve their goals (Pinkse and Groot, 2013; Dean and McMullen, 2007). A range of studies look at the actors involved, focusing on the motivation or intention of the entrepreneurs (Kuckertz and Wagner, 2010; Parrish, 2010; Gray and Balmer, 2004; Schaltegger, 2002), the influences within the institutional context (Meek et al., 2010; Pacheco et al., 2010; O'Neill et al., 2009; Parrish and Foxon, 2009; Isaak, 1998) or the relationship between different actors, such as incumbents and start-ups (Hockerts and Wüstenhagen, 2010).

2.3 Green start-ups and their specific characteristics and challenges

Sustainable entrepreneurship can unfold in established companies (incumbents) as well as in emerging and young companies (start-ups). While well-established, incumbent firms often improve on radical innovation by investing in incremental innovation processes, radical innovation disproportionately often originates in smaller and entrepreneurial new firms (cf. Baumol 2010). Similar findings have also already been established for sustainable innovation (Fichter and Weiß, 2013), implying a stronger impact of start-ups in the transition towards a sustainable or green economy. In this article, we therefore focus specifically on green start-ups. They have to meet a triple bottom line; the focus of their business activity, though, is on products or services that have a positive environmental impact and contribute to the environmental goals of a Green Economy. That is why they are labelled "green".

The "green" characteristics of start-ups may relate in particular to three aspects of their business:

- **Product-related characteristics** – Are the products (goods or services) of the start-up green or not? While researchers and practitioners like to speak of a "green" or "cleantech" sector (e.g. Eurostat 2009), we argue that green goods and services can be offered in most, if not all, sectors. Therefore it is sensible to look at the (potential) environmental impact of the products and analyse the extent of greenness based on these credentials. One sector classification that is helpful in this regard, is the "Environmental Goods and Services Sector" classification developed by the EU statistical office Eurostat (2009), which focuses both on end-of-pipe solutions (CEPA – classification of environmental protection activities) as well as resource management approaches (CReMA – classification of resource management activities). These classifications cover all business-related activities, which contribute to seven overarching environmental goals: renewable energy, energy efficiency, renewable resources, resource efficiency, circular economy, waste management, emission reduction and climate protection as well as biodiversity and ecosystems.

Product-related characteristics of the start-ups give an indication of how well these goals can be achieved.

- **Entrepreneur-related characteristics** – How do entrepreneurs contribute to the greenness of their start-ups' activities? Many authors in the sustainable entrepreneurship literature focus on the impact of the motivation (e.g. Gray and Balmer, 2004; Schlange, 2006; Schaltegger and Wagner, 2011), values (e.g. Parrish, 2010) and attitudes (e.g. Kuckertz and Wagner, 2010) of the entrepreneurs on sustainability-related issues in the company. Additionally, the technical, business-related and sustainability-related qualification and knowledge of the entrepreneur can be considered relevant (e.g. Choi and Gray 2008; Nicholls and Pharoah, 2008; Patzelt and Shepherd, 2011). These have an impact on how the start-up is run and developed over time.
- **Strategy-related characteristics** – How can strategy strengthen or weaken the sustainability of the company? While these characteristics are obviously linked to the entrepreneur, the start-up's strategy is decided by more factors than "just" the founder's values and wishes. Rather strategy is developed through continuous interaction between the founders and managers of a company and the external stakeholders, such as investors, suppliers and customers.

While their significance and impact have been identified, research has yet to explore the full range of potential additional challenges and new opportunities that green start-ups may experience compared to that of other start-ups and how these may impact their dealings with investors and other market actors such as customers, employees, suppliers, competitors, and support organisations. When start-ups develop green goods or services, they attempt to find market-based solutions to environmental problems that up to recently have been mainly considered the domain of politics and non-profit organisations (cf. York and Venkataraman, 2010), which may take considerable effort and time (Freimann, 2005). As the types of entrepreneurial motivation, knowledge and backgrounds observed are more diverse and often less business-oriented than in typical start-ups (e.g. Patzelt and Shepherd, 2011), they may have challenge looking for support and money from more conventionally business-minded actors (cf. Linnanen 2002). In company strategy, critical trade-offs may arise between the goals of environmental, social and economic sustainability within a triple-bottom-line – especially as external actors may interfere with sustainability-related strategic goals (Freimann et al. 2010).

Research on sustainable business often emphasises the existence of a business case for sustainable business practice (e.g. Schaltegger et al., 2012; York and Venkataraman, 2010; Porter and Kramer, 2006). Making this connection is helpful in overcoming the earlier existing dichotomy between economic (consumption oriented, individualist) and societal (collectivist) values (cf. Walley and Taylor, 2002). However, in order to assess potential challenges green start-ups experience in their day-to-day operations as well as strategic considerations, it is important also to be aware of difficulties in trade-offs and decision-making that might potentially arise from existing, dominating market structures and the sustainability-related aspects of entrepreneurship (cf. Shepherd and Patzelt 2011).

2.4 Financing green start-ups

Green start-ups like any other start-ups are dependent on adequate resource acquisition. Finance is characterised as a central aspect of entrepreneurial success (Schaper, 2002). Sufficient initial capital may provide start-ups with a buffer that enables them to over-

come low performance and liquidity difficulties in the early phases (Gimeno et al., 1997). Conversely, insufficient financial means have been cited as a main reason for the failure of start-ups in the first years of their existence (cf. Carter and Van Auken, 1990). There is a range of investment options involved in entrepreneurial finance that depend, amongst others, on stage of company development, size of investment and characteristics of the company. More "informal" sources of finance are found in business angels as well as friends and family of the entrepreneurs who invest at early stages and small-medium large sums of money (e.g. Börner, 2005; Brettel, 2005; Steier, 2003). Formal institutions such as banks and venture capital firms are among the most prominent sources at later stages and for larger sums (e.g. Börner, 2005; Kollmann, 2005). Entrepreneurs themselves often provide a substantial sum of the money needed for company development (cf. Bygrave and Quill, 2007; Bhide, 1992; Carter and Van Auken, 1990). Additionally, in the European context, public funding programmes for small, entrepreneurial companies are fairly widespread.

Green start-ups and sustainable entrepreneurs may be able to find some sources that target them specifically. These providers include "sustainable" business angels who invest in a value-oriented manner (cf. Brettel, 2005), green/social venture capital firms focussing specifically on cleantech or social innovation respectively (e.g. Randjelovic et al., 2003), venture philanthropists seeking to increase the societal impact of the entrepreneur (John, 2006; Nicholls and Paton, 2009), a handful of social banks (Weber, 2011; Cowton and Thompson, 2001) and microfinance as well as, more recently arising, crowdfunding platforms where informal investors invest for a range of reasons (cf. Lehner, 2012).

Any start-up may indeed experience difficulty initially when looking for money due to its lack of collateral/revenues, unknown/inexistent credit history and/or radical innovation with no market history or benchmark (cf. Staroßom, 2013; Cosh et al., 2009; Kerr and Nanda, 2009; Megginson and Smart, 2006; von Nietzsch et al., 2005). However, a green start-up might experience further and other challenges due to their involvement in business activities where markets generally do not work well (Patzelt and Shepherd, 2011; Di Domenico et al., 2010; York and Venkataraman, 2010) and the attempted mobilisation of resources occurring in institutional environments that are not very supportive (Desa, 2012). Radical sustainable innovation can take considerable time and effort (cf. Freimann, 2005), which does not necessarily correspond well with expectations of short investment horizons (cf. Randjelovic et al., 2003). The potential conflict between short-term profits and a triple bottom line of economic, environmental, and social value creation may create difficulties related to entrepreneur-investor relations and a potential "mission-drift" of the company. Financing green start-ups may thus very well differ substantially from financing other start-ups (cf. Shepherd and Patzelt, 2011).

In research on sustainable entrepreneurship – including literature on social entrepreneurship and on environmental entrepreneurship – finance as a topic has thus far been explored fairly narrowly (cf. Moore et al., 2012). Existing research related to environmental entrepreneurship has looked primarily at cleantech companies with high capital demands (e.g. renewable energy technology) that are funded by venture capital funds (cf. Caprotti, 2011; Hargadon and Kenney, 2011; Bürer and Wüstenhagen, 2008; O'Rourke, 2005; Wüstenhagen and Teppo, 2006; Randjelovic et al., 2003). As opposed to research on environmental entrepreneurship, the variety of financial instruments assessed in research on social entrepreneurship is greater. However, demand-side focus lies mainly on social businesses (and social investors) that are "sustainability driven" and often have zero or negative expected returns (e.g. Nicholls and Paton, 2009; Achleitner et al., 2007; John,

2007), with some (partial) exceptions (McWade, 2012; Moore et al., 2012; Emerson and Spitzer, 2007). There have been calls for more research in this area (Shepherd and Patzelt, 2011; Nicholls and Pharoah, 2008).

2.5 Typologies in sustainable entrepreneurship research

There is a range of typologies distinguishing different types of sustainable entrepreneurship in the literature. We summarise a selection of these in Table 1. A typology must identify crucial characteristics relevant to the issue at hand - here challenges in financial access. The suitability of the typologies above therefore depends on their goal and usage. When the focus is, on the one hand, on sustainable entrepreneurship in start-ups and, on the other hand, on finance, there are two main characteristics that may be considered crucial in a typology: Societal impact and level of profitability. The typologies of Hockerts and Wüstenhagen (2010) as well as Isaak (1998) are somewhat limited in scope as they focus on a comparison of start-ups as one big group with established incumbents as another. The typology of Freimann et al. (2010) is similarly limited as only one of the groups involves start-ups with green products and services and the start-ups in the other two either focus on environmental management or have no environmental focus. While the typology of Zahra et al. (2009) is interesting in terms of the scope and level of societal impact it explores, they focus primarily on companies that are not-for-profit. The typology that Lepoutre et al. (2013) develop for a study on social entrepreneurship in the Global Entrepreneurship Monitor is also of interest. However, here the scope is not only on such companies that work in a market context, rather also such that are not and will not become financially self-sustaining. Their other types can be captured by the remaining typologies presented below.

This reduces the list of typologies to a smaller set of those focusing on core business in a market context, impact and level of profit-orientation (as estimated by type of motivation). Three of the listed typologies, which focus on environmental entrepreneurship, thus come closer than the others to describing the broader spectrum of sustainable entrepreneurship from less profit-oriented to more profit-oriented with lower to higher levels of societal impact. These typologies – Linnanen's (2002) typology for environmental entrepreneurs, Schaltegger's framework for ecopreneurship (2002) and Walley and Taylor's typology of green entrepreneurs (2002) – complement each other in describing types with different kinds of intention (profit/sustainability) driving the entrepreneurs as well as the market and societal impact their start-ups have.

Linnanen (2002) describes four types of environmental entrepreneurs across two dimensions (wish to change the world and desire to make money), which indicate motivation as well as intended societal impact: self-employers, non-profit businesses, opportunists and successful idealists. Schaltegger (2002) differentiates between three main types of entrepreneurial actors: alternative actors, bioneers and ecopreneurs. For Schaltegger, all of these actors have environmental performance as a core business goal and can thus be seen as sustainable entrepreneurs. Yet, he places a particular emphasis on the "substantial contribution" that is achieved through a "significant market influence", which can be measured by a large market share or an influence on competitors to take similar action: i.e. by ecopreneurs (Schaltegger, 2002). He does, however, make a point of the fluidity of boundaries between the different types of actors: alternative actors sometimes turn into bioneers with an interest in a higher turnover, and may bioneers increase their market share and turn into ecopreneurs. Walley and Taylor (2002), on the other hand, consider each contribution that different sustainable entrepreneurs make as equally worthy of anal-

ysis. They differentiate between four different types: innovative opportunists, visionary champions, ethical mavericks and ad hoc enviropreneurs.

Table 1. Characteristics of typologies in sustainable entrepreneurship literature

Author (year)	Main characteristics of typology	Typology (actor types)	Type of organisation	Central social unit	Main purpose of the typology
Isaak (1998) "green-green business"	Degree of environmental orientation of a company's core business	-Green business -Green-green business	Start-ups and incumbents	Organisations	Development of strategies for promotion of ecopreneurship within private-sector initiatives
Linnanen (2002) "Environmental entrepreneurs"	Internal motivation: the desire to change the world and the desire to make money and grow the business	-Self-employer -Non-profit business -Opportunist -Successful idealist	Start-ups	Mixture of organisations and individuals	Unspecified
Schaltegger (2002) "Ecopreneurs"	Degree of environmental orientation of a company's core business and the market impact of the company	-Alternative actors, -Bioneers, -Ecopreneurs	Unspecified	Individuals and their role in a company	Framework provides a reference for managers to introduce ecopreneurship
Walley and Taylor (2002) "Green entrepreneurs"	Internal motivation and external (hard and soft) structural influences	-Innovative opportunists, -Visionary champions, -Ethical mavericks, -Ad hoc enviropreneurs	Unspecified	Interrelation between persons and external structures	Contribute to further research into ways of fostering green entrepreneurship
Zahra et al. (2009) "Social entrepreneurs"	Type of market and societal impact	-Social bricoleur, -Social constructionist, -Social engineer	Unspecified	Individuals	Assess the level (local vs. global) and type of (small-scale, institutional, "revolutionary") impact
Freimann et al. (2010) "Ecopreneurs"	Type and amount of environmentally friendly business measures implemented at the start	-Eco-dedicated start-ups -Eco-open start-ups -Eco-reluctant start-ups	Start-ups	Mixture of organisations and individuals	Discovering opportunities for implementation of environmental management from the beginning of a company

Author (year)	Main characteristics of typology	Typology (actor types)	Type of organisation	Central social unit	Main purpose of the typology
Hockerts and Wüstenhagen, (2010) "Sustainable entrepreneurs"	Degree of environmental orientation of a company's core business and reach due to market presence	-David -Goliaths	Start-ups and incumbents	Organisations	Demonstrate the different, but complementing roles of incumbents and new ventures in sustainable entrepreneurship
Lepoutre et al. (2013) "Social entrepreneurs"	Presence of "social mision" and type of revenue model	-Traditional NGO -Not-for profit social enterprise -Social hybrid social enterprise -Economic hybrid social enterprise -For profit social enterprise	Start-ups and incumbents	Organisations	Enabling empirical research of social enterprises at the macro-level

2.6 Conclusion: Need for a new typology of green start-ups

While the three described typologies are helpful in considering the motivation, societal impact and level of profitability of the companies involved in sustainable entrepreneurship, neither is focusing explicitly on start-ups nor financial challenges. There is thus a clear need to go beyond existing typologies of sustainable entrepreneurship and to develop a new typology, which is suitable to properly analyse and explain the financial challenges and opportunities of green start-ups.

3 Methodology

In order to empirically assess different types of green start-ups according to aspects that are of relevance to sustainable entrepreneurship in green start-ups (core business with a positive environmental impact) as well as in finance (e.g. profitability, risk, time-horizon, size/growth, investment needs), a typology can prove helpful. While the existing typologies presented in section 2 provide a good foundation, they neither focus on start-ups nor on challenges or financial access specifically. In section 4 we therefore suggest an elaborated typology building on these existing ones by addressing issues related to the green start-up: its products/services, the founder/founding team and the company strategy. This exploration is informed by the research on sustainable entrepreneurship as well as further

literature on sustainable business (e.g. environmental management, CSR and business ethics) and start-up financing. Having explored these issues in general, we then attempt to describe the green start-up types considering such issues specifically and then address the potential consequences for financial access. Thus, we follow a deductive method, which constructs types of green start-ups by deducing them systematically from existing concepts of sustainable entrepreneurship and theoretical considerations based on research results on sustainable entrepreneurship and start-up financing.

4 Conceptual development

What issues are of relevance in explaining the characteristics and challenges of green start-ups? A range of issues arise in the sustainable entrepreneurship and sustainable business literature. In the following part we focus on characteristics that allow for a distinction of different types of green start-ups. In order to systematically assess the characteristics distinguishing different types of green start-ups, we assign these to three overarching categories: product/service-related characteristics, entrepreneur-related characteristics as well as strategy-related characteristics, as described in section 2.3. Not only do these three categories cover the most important aspects of young companies, they are also the ones that are of central importance to investors deciding whether or not to invest in such companies (cf. Wüstenhagen and Teppo, 2006).

A division into these categories helps us understand how sustainability-related and environmental issues have an impact on the factors that are decisive to investors: required size of investment, risk, expected return and time-horizon of investment (cf. Emerson and Spitzer, 2007; McWade, 2012). The product/service characteristics have an impact on the value proposition and thus all these aspects. Furthermore, the entrepreneur/team as well as the strategy are of crucial importance as these give investors an indication of whether the entrepreneur(s) are considered competent and are seen to have the same goals and strategies as that of the investor, which is considered to be of utmost important in early stage investment deals where uncertainty abounds (cf. Breuer and Breuer, 2005). These overarching categories are certainly interconnected. Nonetheless, distinguishing the characteristics along these lines facilitate an analysis of the concrete factors that influence investors' decision-making, instead of having one black box of reasons ("the company").

4.1 Product/service-related characteristics

Product/service quality. Mass-market production often demands highly competitive (i.e. low) prices that may in turn require low-quality inputs. Low product quality leads to a more frequent disposal of products and higher consumption of new products and thus resources. Planned obsolescence has been described as a deliberate, unsustainable strategy to lower the quality of products in order to shorten the product lifespan and induce new purchases and increased consumption (Cooper, 2010; Guiltinan, 2008; Giaretta, 2005) and is partially caused by capital market and profit orientation (Schridde and Kreis, 2013). Other consequences of low-quality material input may include health deterioration and toxic waste in landfills.

Environmentally friendly products or services are such that reduce environmental impact by, amongst others, making use of renewable resources (materials and energy) and eco-design, while avoiding toxic materials and ensuring health safety. Green products and services are thus in general such that have a higher quality in a holistic sense and are often

labelled and certified as such. One consequence of such high product/service quality is that a frequent disposal of old products becomes less likely. Also, a high quality is perceived by leading sustainable companies to give them a competitive advantage in reputation – something which is difficult to imitate (Petersen, 2003).

Long-term focus. Like in most processes of post-industrial society, the tempo in innovation cycles is increasing (Fichter, 2005), amongst others due to globalisation, information technology and increased competition (cf. Giaretta, 2005). Similarly, product lifespan are decreasing, which makes the time to compensate investment in R&D limited (Baumol, 2010). Sustainable innovation processes involve finding solutions to complex problems, which may require a long-term focus. The phase of the market launch is in the case of innovative, sustainable products often longer than for more conventional products, which may cause comparatively higher costs even before any earnings has been made (cf. Freimann, 2005). Additionally, current technical and market infrastructures may not be suitable for future sustainable solutions and path dependencies may hinder and slow down the diffusion of radical innovation (cf. Rennings, 2000).

Need-orientation. The starting point for sustainable innovation can be said to be the fulfilment of actual and, largely, already existing needs (cf. Pfriem, 2011). Many sustainable entrepreneurs seek solutions to the "wicked" societal problems of the world and are concerned with fulfilling needs of the base-of-the-pyramid (the largest and poorest socio-economic population group) as opposed to catering to ever-increasing consumer demands in the industrial world (cf. Pfriem, 2011; Cohen and Winn, 2007; Fichter, 2005; Prahalad and Hammond, 2002). Globally, poorer population segments have often been observed to pay higher prices for goods/services due to e.g. poor infrastructure and a prevalence of the informal economy (Prahalad and Hammond, 2002). In specific cases, sustainable entrepreneurs offer products at lower prices, while remaining profitable, e.g. by focusing on the aggregated purchasing power of communities or developing pay-per-use or sharing models (Prahalad and Hammond, 2002).

4.2 Entrepreneur-related characteristics

Sustainability-related motivation. Sustainable entrepreneurs' motivation may be a mix of sustainability-related and profit-oriented (cf. Schaltegger and Wagner, 2011), but can also be predominantly either one or the other (cf. Parrish, 2010; Shepherd and Patzelt, 2011). Sustainability-driven entrepreneurs are seen as having the potential to create more radical innovation, as these entrepreneurs often wish to challenge the legitimacy of conventional business (York and Venkataraman, 2010). Altruistic tendencies might furthermore facilitate an entrepreneur's recognition and creation of sustainable innovation (Patzelt and Shepherd, 2011). Environmental entrepreneurs, as opposed to social entrepreneurs, are often described as profit oriented (Thompson et al., 2011), but as they often also have a sustainability-related motivation (cf. Schlange, 2006; Gray and Balmer, 2004), the level of profit aspired to can vary considerably from one entrepreneur/team to the next. A sustainability-related motivation in some cases opens up to a collaborative approach and open innovation (cf. Vickers and Lyon, 2012; McPhedran Waitzer and Paul, 2011; Doyle Corner and Ho, 2010; Pacheco et al., 2010; Petersen, 2003), which in turn may have an impact on the levels of externalities and profit.

The use of guiding sustainability principles. While consumption, any consumption, from a conventional economic perspective is always desirable (Pfriem, 2011), sustainable business is linked to the guiding principles of efficiency, consistency and sufficiency (cf. Young and Tilley, 2006). Efficient resource use through reduction, reuse and recycling

indicate a more sustainable approach to production and can be a source of cost efficiency (cf. Cohen and Winn, 2007; Porter and Kramer, 2006; Horbach et al., 2000). Consistency, on the other hand, relates to the environmental compatibility and recyclability of materials. This principle applies to approaches such as biomimicry (Fichter, 2005) and "cradle-to-cradle" or upcycling (Braungart and McDonough, 2002). Lastly, sufficiency relates to finding the suitable measure of consumption and indicates a conscious contribution by business towards more (globally and inter-generationally) sustainable consumption patterns in society (cf. Fichter, 2005). All guiding principles are a potential source of inspiration for innovative business models and product-service-systems. Sustainable entrepreneurs are observed to value frugality, reuse/re-purpose materials (Gagnon, 2012) and practice "resource perpetuation", i.e. enhance and maintain resources as long as possible (Parrish, 2010).

Business qualification of the entrepreneur/entrepreneurial team. Business qualification is considered of paramount importance in both general entrepreneurship and sustainable entrepreneurship. While sustainable entrepreneurs/teams who are more motivated by their contribution towards sustainability than by earnings may have thorough knowledge of social or environmental issues (Patzelt and Shepherd, 2011), a very pertinent academic background and may be highly qualified (Nicholls and Pharoah, 2008), they may lack business qualification (cf. Choi and Gray 2008; Nicholls and Pharoah, 2008). One consequence of this may be that aspects like marketing strategy and financial plan are given too little prominence in investment proposals and business plans (cf. Randjelovic et al., 2003).

4.3 Strategy-related characteristics

Level of market-orientation. Many green start-ups effectively use market mechanisms to offer their sustainable products/services. Others may lack market-orientation and be more principally against the workings of the current market economy and work towards a more radical transformation of both the economy and society (cf. Vickers and Lyon, 2012; York and Venkataraman, 2010). They may have and develop a very different organisational logic than conventional start-ups (Gibbs, 2009). Their strategy may thus involve engaging in "alternative" economic approaches (Schaltegger, 2002) that diverge from that of the market economy at a local or regional level, such as bartering, sharing and local, community currencies, or at the global level through open source development (cf. Vickers and Lyon, 2012)

Growth willingness. Even if growth is still seen as a "must" for most conventional and also sustainable businesses (cf. Vinturella and Erickson, 2004), a reassessment of this strategy is becoming visible (cf. Nazarkina, 2012; Linnanen 2002). Even in conventional business, growth research finds that small businesses may intentionally refrain from opportunities to grow (Wiklund et al., 2003; Davidsson, 1989). In sustainable companies, this scepticism can be explained by a fear of having to compromise on sustainability issues (cf. Howard and Jaffee, 2013; Vickers and Lyon, 2012) and high product quality (Hockerts and Wüstenhagen, 2010), or diminishing product exclusivity (Petersen, 2003). Increasing demands for local products may favour multiple, small companies based regionally, close to the markets (York and Venkataraman, 2010). On the one hand, a large number of small companies can be said to contribute to "eco-growth" (Clausen, 2004). On the other hand, growth is sometimes seen as a strategy of "creative destruction" (cf. Schumpeter, 1947) by "sustainable champions" (Petersen, 2003), forcing other, more unsustainable businesses out of the market (cf. Nazarkina, 2012; Parrish, 2010; Clausen, 2004).

Control and decision-making rights. Sustainable entrepreneurs who are motivated by their contribution to sustainability may be wary of sharing decision-making powers with external actors due to a fear of conflict of interest or "mission drift", i.e. economic concerns becoming a more important goal than the sustainability impact (cf. Vickers and Lyon, 2012; Nicholls and Paton, 2009; Nicholls and Pharoah, 2008; Choi and Gray, 2008; Gray and Balmer, 2004). At the same time, cooperative company forms are described as particularly sustainable despite, or perhaps rather because of, their ability to integrate a large range of opinions and decision-makers (cf. Ridley-Duff, 2009).

4.4 Overview of characteristics and potential impact on financial access

Not only different types of sustainable entrepreneurs, also investor types can be distinguished (cf. Wüstenhagen and Menichetti, 2012). These may differ both in terms of their preferences with regard to risk-return-levels and regarding attitudes and exposure to sustainability (cf. McWade, 2012). Taking the different types of investors into account, Table 2 explores the relevance of the different characteristics of green start-ups with regard to a possible impact on their financial access.

Table 2. Overview of characteristics and potential impact on financial access

Characteristic	Relevance to finance
Product/service-related characteristics	
Product/service quality	Investors may see high quality as both a challenge (if they target mass-market segments) and opportunity (if they target exclusive niche markets of high quality or are interested in the environmental impact).
Long-term focus	Research on venture capital (VC) assert the need for longer investment periods in green start-ups and that this can lead to a lack of interest in many VC funds (Linnanen 2002; Randjelovic et al. 2003), but also observes a longer average engagement time in actual VC investment for green start-ups (Randjelovic et al. 2003).
Need-orientation	Investors might expect lower returns from the base-of-the-pyramid and thus perceive need orientation as a challenge. It might also impact the time-horizon of the investment as "wicked" problems are rarely solved by a quick fix. However, sustainability-oriented investors sometimes explicitly target companies that focus on the base of the pyramid, e.g. through impact investing or microfinance institutions.
Entrepreneur-related characteristics	
Sustainability-related motivation	A sustainability orientation (cf. Randjelovic et al. 2003; Schick et al. 2002; Linnanen 2002), "green image" (Wüstenhagen & Teppo 2006) or business plan with information on sustainability impact (Randjelovic et al. 2003) can cause a negative reaction from financial advisors and investors. On the other hand, so-called high net worth individuals with a sustainability orientation are the primary source in sustainable VC funding

Characteristic	Relevance to finance
	(Randjelovic et al. 2003). Motivation may have an impact on decision-making and, therefore, the level of profitability of the venture. Sustainable entrepreneurs may thus experience a challenge in finding conventional investors willing to invest. Sustainability-oriented investors may see entrepreneurs with a sustainability-related motivation as an opportunity and a safer bet in reaching their extra-financial goals.
Use of guiding sustainability principles	Efficiency and consistency leading to reduced financial needs, and possibly increased return can be seen as an opportunity for investors. Sufficiency may be seen as a challenge by most investors as it can lead to reduced consumption.
Level of business qualification	A lack of business qualification may be perceived as a lack of professionalism or needed skills by investors (cf. McWade 2012; Nicholls and Pharoah 2008), creating a reluctance or scepticism on their part.
Strategy-related characteristics	
Level of market-orientation	Most investors are unlikely to be interested in sustainable start-ups that lack a market-orientation. Some informal investors who operate at a low-funding level such as individuals on crowdfunding platforms and microfinance institutions may be open to funding such start-ups.
Level of growth	Low or organic growth will have a comparable influence on the level of profitability and the ability to repay investors. High-growth green start-ups are often more "business-like" and thus more easily find interested investors (cf. Hockerts and Wüstenhagen 2010). Especially equity finance has been found to be conducive to growth and efficiency, amongst others in the context of cooperative social enterprises (Ridley-Duff 2009). Green VC firms will also expect high growth. Microfinance institutions or alternative banks will only seek repayment of the (generally speaking low-sum) debt.
Control & decision-making rights	External equity investment involves control, oversight and participation in decision-making by investors. Involving investors in decision-making may cause a prioritising of financial aspects over sustainability-related ones in cases of trade-off (cf. Linnanen 2002). Some sustainable entrepreneurs may seek investors with a similar perspective (Hasenhüttl 2008), i.e. sustainability-oriented investors.

4.5 Relevance and implications for different types of green start-ups

As can be deduced from the discussion, not all green start-ups can be considered to have the same product/service qualities, entrepreneurial character and company strategies. While we build on the three described typologies of sustainable entrepreneurs (Linnanen (2002), Schaltegger (2002) and Walley and Taylor (2002)), which in combination de-

scribe a spectrum of types, we elaborate on these and offer a broadened typology. This broader typology involves not focusing only on the entrepreneurs, but rather also on the product/service they offer and the strategy of the new/young company. In research on sustainable entrepreneurship, there has been a strong emphasis on analysing the entrepreneur and their intentions and motivation. This focus on the person behind the start-up goes back to early theory on conventional entrepreneurship (cf. Kirzner, 1973; Schumpeter, 1947). We argue that a broader perspective is needed in order to thoroughly and effectively evaluate the extent to which the above mentioned characteristics, which differ in types of green start-ups, have an impact on their everyday business operations, on financial challenges and opportunities as well as success in the longer term. With regard to the investigation and explanation of financial challenges and opportunities of green start-ups, it is appropriate to develop a typology, which explores the start-up as a whole (and adopts an organisational perspective). Of course investors are interested in the entrepreneurs as the key individuals of a start-ups, but banks, venture capitalist, business angels and other investors are also interested in the products and services of the start-up and in its strategy and business model. Furthermore, a narrow focus on the entrepreneur might moreover not always be appropriate for sustainable entrepreneurship. In the context of social entrepreneurship, Doyle Corner and Ho (2010) speak of the "collective entrepreneur" as sustainability-related ventures are observed to often require a shared effort.

Table 3 below describes the synthesised and elaborated typology in a comparable fashion to the description of other typologies in Table 1. The usage of the types developed by Linnanen (2002), Schaltegger (2002) and Walley and Taylor (2002) becomes clear in the below description of the individual start-up types with relation to the characteristics described above.

Table 3. Characteristics of the elaborated typology of green start-ups

Main characteristics of typology	Typology (actor types)	Type of organisation	Central social unit	Main purpose of the typology
- Product-related characteristics - Entrepreneur-related characteristics - Strategy-related characteristics	- The alternative start-up - The visionary start-up - The inventive start-up - The ecopreneurial start-up - The unintentionally green start-up	Start-ups	Interrelation between key individuals (entrepreneurs) and key organisational characteristics (products, strategy)	Framework for empirical research on financial challenges and opportunities of green start-ups

Type 1: The alternative start-up. The self-employer (Linnanen 2002), the non-profit business (Linnanen 2002), the ethical maverick (Walley and Taylor, 2002) and the alternative actor (Schaltegger, 2002) can all be found in alternative start-ups. The entrepreneurs/teams are motivated by making a contribution to sustainability (or, in the case of the self-employer, avoiding the mistakes of large corporations). Their background experience and knowledge often comes from a social or environmental movement and not formal business education or practice. Their personal motivation may be influenced by their wish to limit their own negative impact (e.g. ecological footprint). They therefore apply the

principles of consistency and sufficiency while attempting to fulfil actual needs, in order to avoid rebound effects and reduce absolute usage of natural resources. These start-ups are a form of "revenue-generating social enterprises" (Nicholls and Pharoah, 2008, p. 18), that operate on the boundary to the market economy. They strive for an independent local or regional economy through autarchy and closed-loop production and consumption. Due to this and their wish not to integrate with the conventional market place, the (implicit) company strategy is one of no or low growth as well as no or low profit. According to Schaltegger (2002), these companies produce solid goods through craftsmanship, and not through arguably more efficient industrial processes. The alternative start-up can also be seen as part of the "slow movement" trying to reclaim time and slow down the ever-increasing pace of modern life and economy. Some use underutilised and undervalued work power, such as seniors, disabled individuals and the "unemployable", in order to both use their skills and knowledge as well as provide a contribution towards community integration. In this type of entrepreneurship, there is an inclination towards open innovation and open source, as positive externalities are explicitly wanted.

Conventional investors are likely to be uninterested in alternative start-ups due to their small funding needs, higher perceived risk level, long time-horizons and low profit-levels. Conversely, such start-ups may be sceptical towards external funding in general due to their political views and/or wish to retain all decision-making power, and therefore seek funding (if at all) through their private networks and in the local community - possibly via crowdfunding. For those who have reached a stage of activity in which income is fairly stable, a loan from the local bank might be an option.

Type 2: The visionary start-up. In visionary start-ups, Walley and Taylor's visionary champion as well as Linnanen's successful idealist can be found. They have a "change the world" mentality and perceive business to be the best means to this end, which means they often have a business-related education. Due to their sustainability-related motivation, entrepreneurs/teams in visionary start-ups may allow for or intentionally create positive externalities. The business focus of visionary start-ups is more global than local and they aim at a mass-market customer base. Growth is a primary goal in order to contribute to creating a more sustainable market. They are however not ready to grow at any price, if this means yielding control or compromising their sustainability principles. The fulfilment of actual needs, e.g. in the base-of-the-pyramid, often in collaboration with other actors, and a high product/service quality are likely to be part of their business model.

These characteristics imply a possibly lower level of return (albeit possibly also high if the mass-market strategy is successful), a high level of risk and a longer time-horizon for investments. While conventional investors may in certain cases be interested in funding visionary start-ups (e.g. in growth phases), the entrepreneurs may feel more comfortable with investors with a similar orientation. Depending on the start-up phase, all types of sustainability-oriented investors may be of interest for the visionary start-ups.

Type 3: The inventive start-up. The motivation of Schaltegger's bioneers operating in inventive start-ups is the most balanced between an economic and a sustainability-related orientation (cf. Schaltegger, 2002). The entrepreneurs/teams behind inventive start-ups are highly inventive, very technically skilled and often socially involved in their community. The entrepreneurs' potential lack of business education or experience can be explained by their technical education and/or inventor background. These start-ups are "socially driven businesses" that yield a financial return (Nicholls and Pharoah, 2008, p. 18). For their prime-quality and sometimes exclusive goods/services, premium prices are charged from their sustainability-oriented target group customers, both to cover above-market cost lev-

els and increase profit (cf. Schaltegger, 2002). Growth is not necessarily a goal, unless the start-up strives towards becoming an ecopreneurial start-up (cf. Schaltegger, 2002). Like in the case of the ecopreneurial start-ups, their business model often lies in high risk high-tech development.

Inventive start-ups may have substantial capital needs and potentially yield high profits, but they may experience considerable difficulty accessing money due to their lower initial scale of operation, higher level of risks and niche strategy. While they might be able to convince certain conventional venture capital firms, they are likely to feel more comfortable with sustainability-oriented investors, such as green/social venture capital firms or social banks. Other types of investors are unlikely to provide them with the amount of capital they require to build prototypes, or at later stages, grow.

Type 4: The ecopreneurial start-up. Linnanen's opportunist, Schaltegger's ecopreneurs and Walley and Taylor's innovative opportunists in ecopreneurial start-ups are primarily economically motivated and highly market oriented. They identify opportunities, which are likely to be scalable and try to achieve high growth in a short period of time. As the entrepreneurs are often not inventors themselves, they rely heavily on other people and possibly a larger network for the realisation of their idea. The start-ups may have considerable environmental impact and have a high level of positive environmental externalities. Due to their highly market-adapted strategy, trade-offs between different sustainability aspects or between environmental sustainability and economic sustainability are more likely to be prevalent in this type of start-up, than in the others described. This increases the level of risk with regard to the sustainability outcome.

These are probably the green start-ups that are most viable for venture capital investment due to their high growth potential and potentially high profitability, and also likely to be interesting to other conventional investors. Their method of working does not deviate considerably from that of current, conventional market logic. This does not necessarily mean that they have the same mind-set as investors, but the "cultural clash" might be considerably smaller.

Type 5: The unintentionally green start-up. Walley and Taylor's ad hoc enviropreneurs are small business owners who "happen" to be involved in a niche business activity that can be considered sustainable. Being primarily oriented by an economic motivation, these entrepreneurs/teams are likely to have some kind of background in business, whether it is through their education, business experience or both. Their implicit contribution to sustainability (as observable in e.g. product quality and long-term focus) can be assumed to originate from their traditionalist values as influenced by their personal networks (cf. Walley and Taylor, 2002). The entrepreneurs unintentionally contribute to sustainability through their start-up and are often not aware that there are or can be positive environmental and social effects resulting from their products or services. We label this type of new and young companies „the unintentionally green start-up". This category of sustainable entrepreneurship matches findings that some sustainable innovation is a chance occurrence (Fichter and Arnold, 2004).

The unintentionally green start-ups may not be seen as a high-risk investment, but indeed one of rather low return. This type of sustainable start-up is likely to be traditional in their financial sourcing and seek a loan from the local bank.

4.6 Overview and discussion

Table 4 summarises the above findings on the characteristics of different types of green

start-ups, which on the whole may be said to indicate their level of sustainability-orientation. In order to make the overall picture clearer, we synthesises the findings and label the extent of a characteristic with the values "low", "medium" and "high". The more sustainability-related the motivation of the entrepreneur/team is (i.e. the more sustainability-driven these are), the more they seem to be sustainability-oriented, i.e. also be affected by other characteristics that may complicate dealings with other market based actors and especially investors. The ecopreneurial and the unintentionally green start-ups are thus likely to have less difficulty in this regard. While the visionary start-up skilfully and deliberately uses the market logic and business strategies to contribute to more sustainability, which opens some new opportunities for them, they will still encounter a range of challenges. The inventive start-ups with their balance of sustainability concerns and economic orientation might similarly struggle, albeit for other, primarily product-related reasons. The alternative start-ups will have most difficulty in interacting with investors, but may not necessarily be worried too much about this due to their inward and small-scale orientation.

Table 4. Matching characteristics with types of green start-ups

	The alternative start-up	**The visionary start-up**	**The inventive start-up**	**The ecopreneurial start-up**	**The unintentionally green start-up**
Product/service-related characteristics					
Product/ service quality	High	High	High	Low-medium	Medium-high
Long-term focus	High	High	High	Low-medium	Medium-high
Need-orientation	High	High	Low-medium	Low-medium	Low-medium
Entrepreneur-related characteristics					
Sustainability-related motivation	High	High	Medium	Low	Low
Use of guiding sustainability principles	High	High	Medium	Low-medium	Low-medium
Level of business qualification	Low	Medium	Low-medium	High	Medium-high
Strategy-related characteristics					
Level of market-orientation	Low	Medium	Medium-high	High	Medium-high
Growth willingness	Low	Medium-high	Medium-high	High	Low-high
Retaining control and decision-making rights	High	Medium-high	Medium	Low	Low-high

4 Limitations & further research

A conceptually developed typology is likely to be fuzzy at best. There is thus a need for empirical investigation to assess its validity. Indeed, the stated aim of this paper was to develop a foundation for future empirical work on green start-ups in the context of finance. The value range indicated in table 4 (low-medium-high) can be seen as a starting point for an ordinal scale to be used in quantitative analysis. The characteristics can be used as items along the dimensions of "sustainability-orientation in product/service development", "entrepreneurial sustainability-orientation" and "sustainability-orientation in start-up company strategy". These dimensions might then capture sustainability-orientation in start-up companies more comprehensively than has been achieved up until now in empirical research. Linking such sustainability-orientation with the usage of financial instruments and sources as well as challenges in a quantitative study-design will enable a more differentiated analysis of financial access in green start-ups.

In addition to an empirical analysis of the actual usage of finance in different types of green start-ups, there is clearly a need for more focused, context-specific research in a range of areas. It has amongst others become clear that the perception, attitudes and orientation of investors may have an impact on how they assess and evaluate the quality of an investment opportunity in a green start-up. The rather simplistic distinction between conventional and sustainability-oriented investor needs further research and more differentiation should be achieved in empirical work. Also the impact of the interaction between the green start-up and the innovation system in which they operate on financial access merits a thorough empirical analysis in future. Neither the interaction between green start-ups and investors nor the financial assessment of risk and future profitability are automatic, straight-forward processes. Rather they are heavily impacted by amongst others institutional logic, asymmetrical information, transaction costs and regulatory conditions.

5 Conclusion & implications

Up until now research on sustainable entrepreneurship has only begun to explore the issue of finance. In this conceptual paper, we have explored why and how different types of green start-ups may have additional challenges and some new opportunities in terms of access and usage of finance to fund their early activities. A range of characteristics related to the product/service, the entrepreneur/team and company strategy may have an impact on investors' assessment and the start-ups' perception of external investors. While we embarked on this paper wanting to point out the differences between sustainable entrepreneurship and conventional entrepreneurship, it has become clear in the exploration of different characteristics that it is likely that there are more differences between the green start-up types themselves than between such types and other start-ups in general. The implication for entrepreneurship research includes a widening of the focus in order to explore the whole potential range of financial usage and needs in green start-ups.

Start-ups are considered illiquid, high-risk investments that have a potentially high return, but in practice often deliver a rather low return. This adverse risk/return situation is likely to be exacerbated for many green start-ups. Entrepreneurs/teams of start-ups that are motivated by their contribution to sustainability (i.e. sustainability-driven start-ups, like the visionary, the alternative and, sometimes, the inventive start-ups) are likely to be sceptical

of equity investment due to having to relinquish decision-making rights and control, unless the investor has a similar orientation. Business angels often accept lower return-levels when they have additional sources of motivation. Sustainability-oriented business angels are thus an interesting finance source for such start-ups to tap into. However, there's a challenge identifying these due to such investors' informal organisation, low-key profile and dispersion. VC firms are increasingly investing in cleantech. However, they are primarily interested in the later company development stages and not so much in the early stage of start-ups and require a high level of return in a relatively short timeframe (making them mostly relevant for ecopreneurial and in certain cases inventive start-ups). While VC firms that focus primarily on cleantech have a somewhat longer time horizon than others, this may not suffice for some radical sustainable innovation processes that require a much longer perseverance and patience. Many green start-ups are thus in need of so-called "patient capital".

We have also seen that, especially for sustainability-driven start-ups, there is a need for continued professionalization; although there is a worry about "mission drift" in such cases. This could be another indication that sustainability-driven start-ups would be well-advised to seek out likeminded investors. Looking at current numbers for "sustainable and responsible investment" (SRI) and impact investment, however, it is clear that these are still marginal compared to conventional investment (even if growing). It would therefore be sensible to tap into the conventional investment markets where possible (e.g. for those start-ups where motivation is more mixed or leaning towards the economic side). On the policy-side, efforts to mainstream relevant investment instruments, such as a "blended value" approach, might be helpful in this respect. Another area where policy and intermediaries could support the development towards a better matching of supply with demand, could be to develop matching instruments that take into account strategies, goals, motivation etc., in order to help start-ups find appropriate investors and vice versa. Information access and qualification programmes for both investors and green start-ups may also enable an improved matching. On the investment side, informal investors who are interested in green start-ups may not be able to alone fulfil the needs (nor shoulder the risks) of such start-ups, in which case both the formation of investor syndicates and investor networks might be beneficial to achieve higher sums and create portfolio effects. The creation of an enabling environment for such strategies is also something that could be offered by intermediaries and supported by incentives in relevant policies.

Green start-ups have the potential of developing and spreading radical, sustainable innovation in all sectors of the economy and contribute to a transformation towards a sustainable, green economy, but may need better access to finance in order to achieve this potential.

5 References

Achleitner, A.-K., Pöllath, R., & Stahl, E. (2007). *Finanzierung von Sozialunternehmern: Konzepte zur finanziellen Unterstützung von Social Entrepreneurs*. Stuttgart: Schäffer-Poeschel.

Arnold, M.G. & Hockerts, K. (2010). The greening dutchman: Philips' process of green flagging to drive sustainable innovations. *Business Strategy & the Environment*, 20, 394–407. doi:10.1002/bse.700

Baumol, W. J. (2010). *Microtheory of innovative entrepreneurship*. Kauffman Foundation

Series on Innovation and Entrepreneurship. Princeton: Princeton University Press.

Bhide, A. (1991). Bootstrap finance: the art of start-ups. *Harvard Business Review*, 70(6), 109–117.

Börner, C. J. (2005). Gründungs-und Wachstumsfinanzierung als Finanzdienstleistung. In *Entrepreneurial Finance* (pp. 81–101). Springer. Retrieved from http://link.springer.com/chapter/10.1007/3-7908-1603-5_5

Braungart, M. & McDonough, W. (2002). *Cradle to Cradle. Remaking the Way We Make Things*. New York: North Point Press.

Brettel, M. (2005). Business Angels. In P. D. C. J. Börner & D. D. Grichnik (Eds.), *Entrepreneurial Finance* (pp. 233–258). Physica-Verlag HD. Retrieved from http://link.springer.com/chapter/10.1007/3-7908-1603-5_12

Breuer, W., & Breuer, C. (2005). Investitionstheoretische Überlegungen zur Gründung. In P. D. C. J. Börner & D. D. Grichnik (Eds.), *Entrepreneurial Finance* (pp. 127–154). Physica-Verlag HD. Retrieved from http://link.springer.com/chapter/10.1007/3-7908-1603-5_7

Bürer, M. J., & Wüstenhagen, R. (2009). Which renewable energy policy is a venture capitalist's best friend? Empirical evidence from a survey of international cleantech investors. *Energy Policy*, 37(12), 4997–5006.

Bygrave, W. D., & Quill, M. (2007). *Global entrepreneurship monitor*. Retrieved from http://new.gemconsortium.org/assets/uploads/1313508038GEM_2006_Financing_Report.pdf

Caprotti, F. (2012). The cultural economy of cleantech: environmental discourse and the emergence of a new technology sector. *Transactions of the Institute of British Geographers*, 37(3), 370–385.

Carter, R. B., & Van Auken, H. E. (1990). Personal equity investment and small business financial difficulties. *Entrepreneurship Theory and Practice*, 15(2), 51–60.

Choi, D. Y. & Gray, E. R. (2008). The venture development processes of "sustainable entrepreneurs". *Management Research News*, 31(8), 558–569.

Clausen, J. (2004). *Umsteuern oder Neugründen? Die Realisierung ökologischer Produktpolitik in Unternehmen*. Dissertation. Nordstedt: Books on Demand.

Cohen, B., Smith, B. & Mitchell, R. (2008). Toward a sustainable conceptualization of dependent variables in entrepreneurship research. *Business Strategy and the Environment*, 17(2), 107–119.

Cohen, B. & Winn, M. I. (2007). Market imperfections, opportunity and sustainable entrepreneurship. *Journal of Business Venturing*, 22(1), 29–49.

Cooper, T. (2010). The significance of product longevity. In T. Cooper (ed.), *Longer lasting products*. Farnham, UK: Gower.

Cosh, A., Cumming, D., & Hughes, A. (2009). Outside Enterpreneurial Capital. *The Economic Journal*, 119(540), 1494–1533.

Cowton, C. J., & Thompson, P. (2001). Financing the social economy: A case study of Triodos Bank. *International Journal of Nonprofit and Voluntary Sector Marketing*, 6(2), 145–155.

Davidsson, P. (1989). Entrepreneurship and after? A study of growth willingness in small firms. *Journal of business venturing*, 4(3), 211-226.

Dean, T. & McMullen, J. (2007). Toward a theory of sustainable entrepreneurship: reducing environmental degradation through entrepreneurial action. *Journal of Business Venturing*, 22(1), 50–76.

Desa, M. (2012). Resource Mobilization in International Social Entrepreneurship: Bricolage as a Mechanism of Institutional Transformation. *Entrepreneurship Theory and Practice*, 36(4), 727-751. DOI: 10.1111/j.1540-6520.2010.00430.x

Di Domenico, M. L., Haugh, H. & Tracey, P. (2010). Social Bricolage: Theorizing Social Value Creation in Social Enterprises. *Entrepreneurship Theory and Practice*, 34(4), 681-703. DOI: 10.1111/j.1540-6520.2010.00370.x

Doyle Corner, P. & Ho, M. (2010). How Opportunities Develop in Social Entrepreneurship. *Entrepreneurship Theory and Practice*, Special Issue: Social Entrepreneurship, 34(4), 635–659. DOI: 10.1111/j.1540-6520.2010.00382.x

Eco-Innovation Observatory (EIO) (Ed.) (2013). *Europe in transition: Paving the way to a green economy through eco-innovation*. Funded by the European Commission, DG Environment, Brussels. Brussels: Eco-Innovation Observatory.

Elkington, J. (1999). *Cannibals with forks: the triple bottom line of 21st century business*. Oxford: Capstone.

Emerson, J. (2003). The Blended Value Proposition: Integrating Social and Financial Returns. *California Management Review*, 45(4), 35-51.

Emerson, J., & Spitzer, J. (2007). *From Fragmentation to Function: Critical Concepts and Writing on Social Capital Markets' Structure, Operation and Innovation*. Retrieved from http://eureka.bodleian.ox.ac.uk/762/

Eurostat (2009). *The Environmental Goods and Services Sector: A Data Collection Handbook*. Luxembourg: Eurostat.

Fichter, K. (2005). *Interpreneurship - Nachhaltigkeitsinnovationen in interaktiven Perspektiven eines vernetzenden Unternehmertums*. Theorie der Unternehmung, 33. Marburg: Metropolis Verlag.

Fichter, K. & Arnold, M. (2004). *Nachhaltigkeitsinnovationen, Nachhaltigkeit als strategischer Faktor*. Schriftenreihe am Lehrstuhl für Allgemeine Betriebswirtschaftslehre, Unternehmensführung und Betriebliche Umweltpolitik, 38. Oldenburg.

Fichter, K. & Pfriem, R. (2007). Leading Innovations to Sustainable Future Markets. In P.D.M. Lehmann-Waffenschmidt (Ed.), *Innovations Towards Sustainability: Conditions and consequences (Sustainability and Innovation)*, (pp. 103–116). Heidelberg: Physica-Verlag.

Fichter, K. & Weiß, R. (2013). *Start-ups: Product Pioneers for a Green Economy*. Berlin: Borderstep Institute for Innovation and Sustainability.

Freimann, J. (2005). *Über die Schwierigkeiten grüner Unternehmensgründungen – Gründungen wie andere auch?* Ökologisches Wirtschaften, Nachhaltig Gründen, 2, 12-13.

Freimann, J., Marxen, S. & Schick, H. (2010). Sustainability in the start-up process. In M. Schaper (ed.), *Making ecopreneurs - developing sustainable entrepreneurship*, 2. Gower, Surrey: Gagnon.

Fussler, C. (1996). *Driving eco-innovation: a breakthrough discipline for innovation and sustainability*. London , Washington DC: Pitman Pub.

Geels, F.W. (2010). Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Res. Policy*, 39, 495–510. doi:10.1016/j.respol.2010.01.022

Giaretta, E. (2005). Ethical product innovation: in praise of slowness. *The TQM Magazine*, 17(2), 161-181.

Gibbs, D. (2009). Sustainability Entrepreneurs, Ecopreneurs and the Development of a Sustainable Economy. *Greener Management International*, 55, 63-78.

Gimeno, J., Folta, T. B., Cooper, A. C., & Woo, C. Y. (1997). Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly*, 750–783.

Gray, E. R. & Balmer, J. M. T. (2004). *The Sustainable Entrepreneur*. Working Paper, 04(14). Bradford, UK: Bradford University School of Management.

Guiltinan, J. (2008). Creative destruction and destructive creation: Environmental ethics and planned obsolescence. *Journal of Business Ethics*, 89, 19-28.

Hargadon, A., & Kenney, M. (2011). *Venture capital and clean technology: Opportunities and difficulties*. Berkeley Roundtable on the International Economy, University of California, Berkeley. Retrieved from http://brie.berkeley.edu/publications/WP%20198.pdf

Hockerts, K. & Wüstenhagen, R. (2010). Greening Goliaths versus emerging Davids - Theorizing about the role of incumbents and new entrants in sustainable entrepreneurship. *Journal of Business Venturing*, 25(5), 481-492.

Horbach, J., Rammer, C. & Rennings, K. (2012). Determinants of eco-innovations by type of environmental impact - the role of regulatory push/pull, technology push and market pull. *Ecological Economics*, 78, 112–122. DOI:10.1016/j.ecolecon.2012.04.005

Howard, P. H. & Jaffee, D. (2013). Tensions Between Firm Size and Sustainability Goals: Fair Trade Coffee in the United States. *Sustainability*, 5, 72-89.

Isaak, R. (1998). *Green logic – ecopreneurship, theory and ethics*. Sheffield: Greenleaf Publishing.

John, R. (2006). *Venture philanthropy: The evolution of high engagement philanthropy in Europe*. Retrieved from http://eureka.bodleian.ox.ac.uk/745/

John, R. (2007). *Beyond the cheque: How venture philanthropists add value*. Retrieved from http://eureka.bodleian.ox.ac.uk/732/

Kemp, R. & Pearson, P. (2007). *Final report MEI project about measuring eco- innovation*. Maastricht: United Nations University, UNU-MERIT.

Kerr, W., & Nanda, R. (2009). *Financing constraints and entrepreneurship*. National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w15498

Klewitz, J. & Hansen, E.G. (2014). Sustainability-oriented innovation of SMEs: a systematic review. *Journal of Cleaner Production*, 65, 57–75. doi:10.1016/j.jclepro.2013.07.017

Kirzner, I. M. (1973). *Competition and Entrepreneurship*. Chicago: Chicago University Press.

Kollmann, T. (2005). Finanzierung von jungen Unternehmen in der Net Economy. In P. D. C. J. Börner & D. D. Grichnik (Eds.), *Entrepreneurial Finance* (pp. 65–80). Physica-Verlag HD.

Kuckertz, A. & Wagner, M. (2010). The influence of sustainability orientation on entrepreneurial intentions - Investigating the role of business experience. *Journal of Business Venturing*, 25(5), 524-539.

Lehner, O. M. (2012). *A literature review and research agenda for crowdfunding of social ventures*. In Research Colloquium on Social Entrepreneurship, University of Oxford, Skoll Center of SAID Business School.

Lepoutre, J., Justo, R., Terjesen, S., & Bosma, N. (2013). Designing a global standardized methodology for measuring social entrepreneurship activity: the Global Entrepreneurship Monitor social entrepreneurship study. *Small Business Economics*, 40(3), 693–714.

Linnanen, L. (2002). An insider's experiences with environmental entrepreneurship. *Greener Management International*, Theme issue Environmental Entrepreneurship, 38, 71-80.

McWade, W. (2012). The Role for Social Enterprises and Social Investors in the Development Struggle. *Journal of Social Entrepreneurship*, 3(1), 96-112.

Markard, J., Raven, R. & Truffer, B. (2012). Sustainability transitions: An emerging field of research and its prospects. *Res. Policy*, 41, 955–967. doi:10.1016/j.respol.2012.02.013

McPhedran Waitzer, J. & Paul, R. (2011). Scaling Social Impact - When Everybody Contributes, Everybody Wins. *Innovations*, 6(2). 143-155.

Meek, W. R., Pacheco, D. F. & York, J. G. (2010). The impact of social norms on entrepreneurial action - Evidence from environmental entrepreneurship. *Journal of Business Venturing*, 25(5), 493-509.

Megginson, W., & Smart, S. (2008). *Introduction to Corporate Finance*. Cengage Learning.

Moore, M.-L., Westley, F. R., & Brodhead, T. (2012). Social Finance Intermediaries and Social Innovation. *Journal of Social Entrepreneurship*, 3(2), 184–205.

Nazarkina, L. (2012). How sustainable are the growth strategies of sustainability entrepreneurs? In G. Mennillo, T. Schlenzig & E. Friedrich (eds.), *Balanced Growth: finding strategies for sustainable development*. Berlin: Springer.

Nicholls, A. & Paton, R. (2009). *Emerging resource flows for social entrepreneurship; theorizing social investment*. Presented at the British Academy of Management Annual Conference. September 2009 (15-17). Brighton: University of Brighton.

Nicholls, A. & Pharoah, C. (2008). *The landscape of social investment: A holistic topology of opportunities and challenges*. Working paper. Oxford: Skoll Centre for Social Entrepreneurship.

Nill, J. & Kemp, R. (2009). Evolutionary approaches for sustainable innovation policies: From niche to paradigm? *Research Policy*, 38, 668–680. doi:10.1016/j.respol.2009.01.011

Nitzsch, R. von, Rouette, C., & Stotz, O. (2005). Kapitalstrukturentscheidungen junger Unternehmen. In P. D. C. J. Börner & D. D. Grichnik (Eds.), *Entrepreneurial Finance* (pp. 409–429). Physica-Verlag HD.

OECD (2009). *Sustainable manufacturing and eco-innovation: Framework, Practices and Measurement Synthesis Report, Eco-innovation*. Paris: OECD.

OECD (2011). *Towards green growth*. Paris: OECD.

O'Neill, G., Hershauer, J. & Golden, J. S. (2009). The Cultural Context of Sustainability Entrepreneurship. *Greener Management International*, 25(5), 493-509.

O'Rourke, A. R. (2005). Venture capital as a tool for sustainable entrepreneurship. In M. Schaper (Ed.), *Making ecopreneurs : developing sustainable entrepreneurship*. Ashgate Publishing, Limited.

Pacheco, D. F., Dean, T. J. & Payne, D. S. (2010). Escaping the green prison: Entrepreneurship and the creation of opportunities for sustainable development. *Journal of Business Venturing*, 25(5), 464-480.

Parrish, B. D. (2010). Sustainability-driven entrepreneurship: Principles of organization design. *Journal of Business Venturing*, 25(5), 510-523.

Parrish, B. D. & Foxon, T. J. (2009). Sustainability Entrepreneurship and Equitable Transitions to a Low-Carbon Economy. *Greener Management International*, 55, 47-62.

Patzelt, H. & Shepherd, D. A. (2011). Recognizing Opportunities for Sustainable Development. *Entrepreneurship Theory and Practice*, 35(4), 631-652.

Petersen, H. (2003). *Ecopreneurship und Wettbewerbsstrategie*. Marburg: Metropolis Verlag.

Pfriem, R. (2011). Jenseits des Konsums – Die Tätigkeitsgesellschaft als nachhaltige Perspektive. In R. Pfriem (ed.), *Eine neue Theorie der Unternehmung für eine neue Gesellschaft*, Theorie der Unternehmung, 52. Marburg: Metropolis Verlag.

Pinkse, J. & Groot, K. (2013). Sustainable Entrepreneurship and Corporate Political Activity: Overcoming Market Barriers in the Clean Energy Sector. *Entrepreneurship Theory and Practice*, Online Version, July 2013. DOI: 10.1111/etap.12055

Porter, M. E. & Kramer, M. R. (2006). Strategy and society – The link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 12, 78-93.

Prahalad, C. K. & Hammond, A. (2002). Serving the World's Poor, Profitably. *Harvard Business Review*, 9, 4-11. (Reprint: R0209C).

Randjelovic, J., O'Rourke, A. R. & Orsato, R. J. (2003). The emergence of green venture capital. *Business strategy and the environment*, 12, 240-253.

Rennings, K. (2000). Redefining innovation — eco-innovation research and the contribution from eco-logical economics. *Ecological Economics*, 32, 319–332.

Ridley-Duff, R. (2009). Co-operative social enterprises: company rules, access to finance and management practice. *Social Enterprise Journal*, 5(1), 50-68. http://dx.doi.org/10.1108/17508610910956408

Schaltegger, S. (2002). A Framework for Ecopreneurship: Leading Bioneers and Environmental Managers to Ecopreneurship. *Greener Management International*, Theme issue Environmental Entrepreneurship, 38, 45-58.

Schaltegger, S., Lüdeke-Freund, F. & Hansen, E. G. (2012). Business cases for sustainability: the role of business model innovation for corporate sustainability. International *Journal of Innovation and Sustainable Development*, 6(2), 95-119.

Schaltegger, S. & Wagner, M. (2011). Sustainable Entrepreneurship and Sustainability Innovation: Categories and Interactions. *Business Strategy and the Environment*, 20, 222-237.

Schaper, M. (2002). Introduction: the essence of ecopreneurship. *Greener Management International*, 2002(38), 26–30.

Schiederig, T., Tietze, F. & Herstatt, C. (2012). Green innovation in technology and innovation management - an exploratory literature review: Green innovation in technology and innovation management. *RD Manag.*, 42, 180–192. doi:10.1111/j.1467-9310.2011.00672.x

Schlange, L. E. (2006). *What drives sustainable entrepreneurs?* Paper presented at the Applied Business and Entrepreneurship Association International Conference 2006. http://www.htwchur.ch/uploads/media/ABEAI_06_Schlange.pdf (Access last on 19.12.2013)

Schridde, S. & Kreis, C. (2013). *Geplante obsoleszenz*. Report prepared for the parliamentary group of the German Green Party.

Schumpeter, J. A. (1947). The Creative Response in Economic History. *Journal of Economic History*, 7(2), 149-159.

Shepherd, D. A. & Patzelt, H. (2011). The New Field of Sustainable Entrepreneurship: Studying Entrepreneurial Action Linking 'What Is to Be Sustained' With ''What Is to Be Developed'. *Entrepreneurship Theory and Practice*, 35(1), 137–163.

Staroßom, H. (2013). Gründungsunterstützung durch öffentliche Hilfen. In H. Staroßom, *Corporate Finance Teil 2* (pp. 73–108). Wiesbaden: Springer Fachmedien Wiesbaden.

Steier, L. (2003). Variants of agency contracts in family-financed ventures as a continuum of familial altruistic and market rationalities. *Journal of Business Venturing*, 18(5), 597–618.

Tasch, W. (2010). *Inquiries into the nature of slow money - investing as if food, farms, and fertility mattered*. Vermont, Chelsea, USA: Green Publishing.

Thompson, N., Kiefer, K. & York, J. G. (2011). Distinctions not Dichotomies: Exploring Social, Sustainable, and Environmental Entrepreneurship. *Advances in Entrepreneurship, Firm Emergence and Growth*, 13, 201-229.

Tilley, F. & Young, W. (2009). Sustainability Entrepreneurs – Could They Be the True Wealth Generators of the Future? *Greener Management International*, 55, 79-92.

United Nations Environment Programme (UNEP) (2011). *Towards a green economy: pathways to sustainable development and poverty eradication*. Nairobi, Kenya: UNEP.

Vickers, I. & Lyon, V. (2012). Beyond green niches? Growth strategies of environmentally-motivated social enterprises. *International Small Business Journal*. Online version at http://isb.sagepub.com/content/early/2012/12/04/0266242612457700 (19.12.2013). DOI: 10.1177/0266242612457700

Vinturella, J. B. & Erickson, S. M. (2004). *Raising Entrepreneurial Capital*. Waltham, Massachusetts: Academic Press.

Walley, E. E. & Taylor, D. W. (2002). Opportunists, champions, mavericks...? A typology of green entrepreneurs. *Greener Management International*, Theme issue Environmental Entrepreneurship, 38, 31-43.

Weber, O. (2011). *Mission and Profitability of Social Banks*. Available at SSRN 1957637. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1957637

Wiklund, J., Davidsson, P. & Delmar, F. (2003). What Do They Think and Feel about Growth? An Expectancy-Value Approach to Small Business Managers' Attitudes toward Growth. *Entrepreneurship Theory and Practice*, 27(3), 247-270.

Wüstenhagen, R., Hamschmidt, J., Sharma, S. & Starik, M. (Eds.) (2008). *Sustainable innovation and entrepreneurship*. Cheltenham, UK, Northampton, MA: Edward Elgar.

Wüstenhagen, R. & Menichetti, E. (2012). Strategic choices for renewable energy investment: Conceptual framework and opportunities for further research. *Energy Policy*, 40, 1-10.

Wüstenhagen, R., & Teppo, T. (2004). *What Makes a Good Industry for Venture Capitalists?: Risk, Return and Time as Factors Determining the Emergence of the European Energy VC Market*. Institut für Wirtschaft und Ökologie. Retrieved from http://stepcapital.de/pages/en/information-center/download-files/Sankt-Gallen-New-Energy-VC-market.pdf

York, J. G. & Venkataraman, S. (2010). The entrepreneur-environment nexus: Uncertainty, innovation, and allocation. *Journal of Business Venturing*, 25(5), 449-463.

Young, W. & Tilley, F. (2006). Can Businesses Move Beyond Efficiency? The Shift toward Effectiveness and Equity in the Corporate Sustainability Debate. *Business Strategy and the Environment*, 15(6), 402-415.

Zahra, S. A., Gedajlovic, E., Neubaum, D. O. & Shulman, J. M. (2009). A typology of social entrepreneurs: Motives, search processes and ethical challenges. *Journal of Business Venturing* 24, 519–532.

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A Book Review for "The Entrepreneurial Rise in Southeast Asia: The Quadruple Helix Influence on Technological Innovation"

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Book Review

The Entrepreneurial Rise in Southeast Asia: The Quadruple Helix Influence on Technological Innovation (Palgrave Studies in Democracy, Innovation, and Entrepreneurship for Growth)
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The collective volume entitled "The Entrepreneurial Rise in Southeast Asia, The Quadruple Helix Influence on Technological Innovation", edited by Stavros Sindakis and Christian Walter, published by Palgrave Macmillan, contributes to the examination of the phenomenon of the entrepreneurial activity grow in the Southeast Asia region. This volume sheds light into the implications of this phenomenon by interconnecting it to particular contextual characteristics, such as the level of innovation, the particular political regime, and economic and social development. Regions seeking to achieve economic and social development aim to create a dynamic framework composed by strong entrepreneurial activity and high levels of innovation. The Southeast Asia is a well chosen geographical area to be researched in order to find evidence to answer questions having to do with the creation of such a dynamic network. This is because during the last decade the Southeast Asia region has evolved into a prime example of a developing area characterized by entrepreneurial growth and increasing levels of innovation.

A few decades ago, the concept of "entrepreneurship" was almost absent from the economic literature. At the same time, there was no interest for the development of SMEs. The idea that the development of entrepreneurship and innovation, mainly through SMEs, could have been a priority for prosperous economies and societies was almost inexistent (Sharma and Venkataraman, 2000). Developing regions, like the SE Asia, was completely absent from the discussion. Not until recently, markets became more open to SMEs and larger companies coming from developing regions. Nowadays, there is an increasing interest and demand for their production capabilities, the services they offer, for innovation development originating from them, and for the implementation of new management ideas. There is indeed an increasing need for entrepreneurial development from developing regions and this trend is expected to continue (Mesquita and Lazzarini, 2010). This volume responds to the need to capture, illustrate and investigate the phenomenon of entrepreneurial rise and innovation development in emerging economies, based mainly on SMEs at a scientific and practical level, exploring its implications for the region itself and for the global economy. In particular, the first theme section of the volume, entitled "Regional Innovative Capacity and New Business Creation" provides valuable insights on the way SMEs can act as a lever of growth for the whole region mainly

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acting as innovation champions through the implementation of new product development strategies. At the same time, this part highlights the challenges SMEs face while attempting to innovate and grow, revealing how these challenges can be managed in a micro and macroeconomic level. As a result, this part provides value implications for management practice and public policy making.

In Southeast Asia, the entrepreneurial development is at the heart of economic policy, at least during the last decade. The number of new enterprises is constantly growing. The same is valid for the number of self-employed people, as a percentage of the total working population (Fox et al, 2009). This book as a whole offers a valuable guide for the ones aiming to be successfully engaged in entrepreneurial activity in this geographic area. It investigates the impact of contextual forces, such as the particular economic, political, cultural and social environment, the capacity to cluster and innovate, to discover and exploit emerging opportunities. Additionally, it deals with the examination of state policies to support start-ups as well as with analyzing case studies providing valuable information on strategic-decision making possesses, and on best practices implementation. Specifically, the second theme section of the volume, entitled "Wealth Creation and Entrepreneurial Financing in Southeast Asia" is devoted to the analysis of the above mentioned framework. Detailed guidance is provided on the ways that can be used to access entrepreneurial financing in the emerging countries of the region in order to fund ideas and young ventures, to develop an entrepreneurial community, and to build an effective entrepreneurship ecosystem.

In the contemporary globalized market the role of human capital seems to be obscure. On the one hand human capital is considered to be the most valuable resource of the company while on the other hand the market reality renders human capital as dispensable. The exploitation of Human Capital for the benefit of the company and the society constitutes a topic of great importance for firms' and society's survival, growth and success (Davidsson and Honig, 2003). In the Information Society the contemporary organization has to "learn" so as to face competition and position itself successfully in the market. The knowledge workers aim to achieve continuous quality improvements and to build effective collaborative networks. At the end of the day, Human Capital is considered to be the spearhead for the achievement of sustainable competitive advantage (Davidsson and Honig, 2003). Developed economies seem to have begun to understand the importance of attaining and managing Human Capital. But how Human Capital is understood and managed in developing regions? The role of Human Capital towards entrepreneurial success and innovation development in the developing region of Southeast Asia is highlighted by the third section of the volume entitled "Human Capital and Organizational Aspects of Innovation". Evidence is provided to interconnect human and intellectual capital to innovation and growth. The role of the "intrapreneur" is examined towards the achievement of organizational and personal goals, attainment of high levels of performance, meeting of shareholders needs, and aligning human capital's potential, coordination, and policies.

A new operational framework has begun to be formulated for contemporary enterprises. The role of the enterprise itself is transforming from an organization seeking to achieve profit maximization and to obtain sustainable competitive advantage towards a socially responsible organization which acts as a regulator and enabler of social development. As posed by major academics during the WIG conference (Gonzales-Perez, 2015), times call for major international multi-stakeholder negotiations. The new entrepreneurial development goals should be shaped as fundamental targets for the liberty, security and prosperity of humanity. Using Burhalter's words, "States alone won't be able to reach the development goals, public and private sectors and markets must cooperate, and work together towards realistic business plans for catalyzing sustainable advancements towards achieving

the Millennium Development Goals (MDG) (liberty, security and prosperity of humanity)" (Gonzales-Perez, 2015). These MDGs are mainly focused on developing countries and regions. The modern research agenda should deal with finding pathways to attain these development targets, through enhancing their constructive economic, social and environmen¬tal impacts (Gonzales-Perez, 2015). Responding to this research call, this book edited by Sindakis & Walter, recognizes and describes the way knowledge and innovation can boost regional development and environmental sustainability. In particular, the theme section IV of the book entitled "The role of knowledge and innovation in regional development" is devoted to the investigation of the key role of knowledge and innovation management towards the promotion of the SE Asia region development. Valuable ideas for researchers and practitioners are shared, describing how digital technologies can be used to create learning and a knowledge sharing environment. In this part, the concept of the quadruple helix innovation to be applied to boost knowledge creation and innovation in a micro and a macroe-economic level is also discussed. Furthermore, the theme section V of the volume entitled "Innovation and Environmental Sustainability in Asia: Today's Challenges Stimulate Future Growth" is exploring environmental and sustainability aspects, providing examples of eco-innovation and environmental regulations in the region. In other words, papers included in these two final parts of the collective volume outline the profile of the modern enterprise in a developing region, as an enterprise which supports knowledge creation, sharing and dissemination, innovation boosting, and eco-consciousness as a part of its CSR and sustainability awareness. This corporate profile is moving towards the MDG's achievement direction.

"The Entrepreneurial Rise in Southeast Asia", is a timely, interesting and well organized book. Filling the significant research gap in the field of (SMEs) strategic entrepreneurship and relevant policy making in developing regions, it addresses a variety of major contemporary entrepreneurship and regional development aspects, in the framework of the fast developing region of Southeast Asia. Adopting a multidimensional and multilevel perspective this book offers valuable insights for students, researchers, entrepreneurs, managers, and policy makers interested in this unique region or generally in developing regions.

References

Davidsson, P., and B. Honig (2003). "The role of social and human capital among nascent entrepreneurs." Journal of Business Venturing, Vol. 18, No.3, pp: 301-331.

Fox, J., Y. Fujita, D. Ngidang, N. Peluso, L. Potter, N. Sakuntaladewi, J. Sturgeon, and D. Thomas (2009): "Policies, political-economy, and swidden in Southeast Asia." Human Ecology, Vol. 37, No.3, pp: 305-322.

Gonzales-Perez, MA (2015). "International Business and the Post-2015 Agenda", AIB Insights, Vol. 15, No. 1, pp 9-11.

Mesquita, L.F., and S.G. Lazzarini (2010). "Horizontal and vertical relationships in developing economies: Implications for SMEs' access to global markets." New Frontiers in Entrepreneurship. Springer New York, pp. 31-66.

Shane, S., and S. Venkataraman (2000). "The promise of entrepreneurship as a field of research." Academy of management review Vol, 25, No 1, pp. 217-226.