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– Cultivating serendipity and efficacy beliefs –
The impact of (Caireen) innovation spaces on human development

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Abstract/Summary

This thesis deals with Caireen 'innovation spaces' and their impact on the human development of their users, and on local development more broadly. As this topic has not been studied in academia so far, the research is of exploratory character. It is innovative in the way that it is the first to academically conceptualize the impact chains which innovation spaces set into motion. Amongst other things, it draws attention to the psychological impact dimension of innovation space usage – something that is completely new, even in non-academic research on the topic. The conceptualization and theory was built based on fieldwork, literature review and the inputs from an international conference on the topic. The fieldwork was conducted at ten innovation spaces in Cairo, Egypt, between March and June 2013. It comprised qualitative in-depth interviews (with the founders/managers and users) and participant observation, as well as a quantitative online survey with users.

Innovation spaces are conceptualized as multi-dimensional 'enabling spaces', as related to Peschl & Fundneider (2012), Prefontaine (2012) and Gathege & Moraa (2013). Development is understood according to Sen (1999), as the expansion of human capabilities. Relatedly, the impacts on users are conceptualized as impacts on users' human capabilities. The empirical data reveals that innovation spaces enhance users' social capabilities, their intellectual capabilities and their psychological capabilities, in addition to benefitting their economic capital. Serendipity alongside four sources of efficacy beliefs, i.e. mastery experiences, observational learning, verbal persuasion and emotional states, are identified as mechanisms cultivated by innovation spaces that are likely to be responsible for the aforementioned impacts on users. Based on Sen (1999), Luthans and colleagues (Luthans, Luthans, & Luthans, 2004; Luthans & Youssef, 2004) and Bandura (1995) it is then argued that this expansion of users' capabilities results in users' improved performance in the projects they engage in. Several empirical examples of such user projects are presented. Based on that, and in line with Sen (1999), it is argued that through these projects, many of which concern the invention of (appropriate) technologies or activism for social change, innovation spaces hold a potential for local development more broadly.

Keywords

Innovation space, coworking space, hackerspace, makerspace, fab lab, human development, capabilities approach, economic capital, human capital, social capital, psychological capital, serendipity, self-efficacy

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0. Preface

This master's thesis constitutes the second part of a two-part study on innovation spaces in Cairo, Egypt. While the first part of this project was presented in the form of a research report to fulfill the requirements of my second semester as a student of Sustainable Development – International Development Studies at *Utrecht University*; this master's thesis goes in partial fulfillment of the graduation requirements of that same program. Building on part one, which conceptualized the innovation space format and analyzed how and why it is implemented in Cairo, through ten case studies, this second part goes into more depth on the topic in how far Caireen innovation spaces indeed manage to reach their goals and have a developmental impact.

The fieldwork for this study was conducted parallel to an internship/consultancy job I did between 24 March 2013 and 25 June 2013 in Cairo. My host organization for the internship was a *large development cooperation organization*[1], and the work was done in affiliation with *AfriLabs*, an organization that seeks to connect different technology hubs throughout the African continent. While this internship was originally also intended to be about innovation spaces, plans changed when I came to the field, and the *large development cooperation organization* finally requested that I do a separate research project for them (a general overview research on the state of the entrepreneurial ecosystem of Cairo in 2013). Yet, it cannot be denied that the two research projects influenced each other. In some cases, I even interviewed the same people for both research projects about different topics in the same interview. The insights I gained from both research projects thus clearly interacted and complemented each other to a certain extent.

[1] The name of the organization has been anonymized upon request. It will hereafter be referred to as "*large development cooperation organization*".

1. Introduction

"There is certainly a lot of excitement, especially on tech hubs in Africa, about what's going on and the opportunities. But the measuring and learning is not happening enough."

(Friederici, 2014)

'Innovation spaces' constitute a new organizational format that first emerged in Europe and the USA, and exponentially spread worldwide over the last decade (Stercken, 2014). What characterizes them is that they are "physical environments that promote community, learning and making" and allow their users to "(1) engage with people, ideas, and technologies, (2) experience participatory culture, and (3) acquire the literacies and skills needed to prosper in the 21st century" (Prefontaine, 2012). They are referred to as 'innovation spaces' because they are theorized to trigger their users' innovativeness (Coward & Wijeweera, 2013a); besides, they can take different forms, including "hubs, labs, libraries, hackerspaces, makerspaces, telecentres, coworking spaces" (Prefontaine, 2012).

Parallel to the emergence of these innovation spaces on the African continent in the last 3-5 years, a lot of excitement has come up. Increasingly often one can read catchphrases about Africa such as "a hopeful continent", "the next frontier for investors" and "a dark horse in the digital revolution" in magazine articles of e.g. the *Economist*, *The Wall Street Journal*, and the *New York Times*. Innovation spaces such as the *iHub* in Nairobi, Kenya, stand at the center of this hype (Aregbesola, 2014). Yet, the argument has also been made that "beyond this hype lies a sterner reality of much fewer key players and shapers, an overt focus on grants and donor funding as opposed to actual investment in local start-ups and a culture that stifles entrepreneurship" (Aregbesola, 2014).

So does this mean that innovation spaces have a real impact on development or are they merely part of a considerable Information and Communication Technology (ICT) related hype about Africa as the "hopeful continent"? As demonstrated by Friederici's (2014) quote at the beginning of this introduction, the actual impact of innovation spaces has hardly been measured, whether in Nairobi or elsewhere.

Part 2 of this study/This thesis tackles this dearth of research, by posing the question of impact with respect to the case studies of those ten Caireen innovation spaces which have already been introduced and scrutinized in part 1. While the Caireen innovation space scene is internationally much less well-known than for instance the one in Nairobi, the analysis of the goals and motivations of the founders/managers of the Caireen spaces presented in part 1 reveal that there is definitely a case for analyzing the developmental impact (Stercken, 2014).

Building on the thematic contextualization, regional framework, methodological approach, case study descriptions and findings presented in part 1, this second part, addresses the overarching research question, "In how far do (Caireen) innovation spaces have an impact on human development, (1) directly in terms of expanding the capabilities of their users, and (2) indirectly in terms of creating social change through the various types of innovation activities their users engage in?" This master's thesis thus first evaluates the impact on users, and secondly analyzes the impact on local development beyond these immediate users.

Following this introduction, section 2 provides an overview of the research objectives and research questions addressed in this master's thesis. Section 3 presents the thematic and regional framework for studying innovation spaces, including relevant definitions, as well as a global and regional contextualization. In section 4, I discuss various approaches and theories, on which I build the conceptual framework: First, I look at former approaches to studying the impact of related initiatives; I define development according to Sen's capabilities approach, for the purpose of this study, and I extend the Senian capabilities framework through insights from Management and Psychology. The conceptual framework is presented in section 5, the research methodology in section 6. Section 7 is divided into two parts. In the first one, I analyze the direct impacts which innovation spaces have on the capabilities of their users. In the second one, I discuss the indirect impacts of innovation spaces on human development which arise from the innovation activities that users engage in at these spaces. Section 8 provides a conclusion to my findings. Section 9 discusses the academic contribution of this master's thesis and makes recommendations for future research.

2. Research Objectives and Research Questions

Research Objective 1: Contribution to Academia

a. Conceptualize how innovation spaces have an impact on their users
b. Conceptualize how innovation spaces have an impact on human development, beyond the immediate users
c. Exploratory analysis of the impact of Caireen innovation spaces on their users
d. Exploratory analysis of the impact of Caireen innovation spaces on human development, with a particular focus on innovation-creation and innovation-distribution for social change (compare Stercken, 2014)
e. Provide recommendations for future research

Research Objective 2: Contribution to (Development) Practice

a. Assess the impact of innovation spaces on their users as well as on local development more broadly
b. Provide an understanding of the impact chains that innovation spaces set into motion for innovation space stakeholders (founders/managers, partners, investors, donors, etc.) (compare Stercken, 2014).

Overarching Research Question and Sub Questions

In how far do (Caireen) innovation spaces have an impact on human development, (a) directly in terms of expanding the capabilities of their users, and (b) indirectly in terms of creating social change through the various types of innovation activities which users engage in?

a. In how far do Caireen innovation spaces have an impact on the capabilities of their users?
b. What is the potential of innovation space users' projects in terms of creating and spreading innovations that are of relevance to creating social change in their local contexts?

3. Thematic, Global and Regional Contextualization of 'Innovation Spaces'

This section aims to provide a basic understanding of what innovation spaces are, and in which context they have to be understood globally as well as regionally. Apart from that, the ten case studies of innovation spaces in Cairo are briefly presented. The section is of particular relevance for the reader unfamiliar with part 1 of this study which mainly focused on contextualizing the innovation space phenomenon. Some parts of the text are written in very close relation to part 1 and can be identified through the reference "compare Stercken, 2014". For a more in-depth understanding, explanations and discussions of definitions, conceptualizations etc., I recommend reading Stercken's (2014) "Innovation Spaces in Cairo – A New Impetus for Sustainable Development?".

3.1 What are innovation spaces?

3.1.1 Defining 'innovation space' and related concepts

As innovation spaces constitute a fairly new phenomenon worldwide, they remain rather under-researched, and it is difficult to come by useful definitions. While academics have only recently started to discuss the concepts of coworking spaces and hacker-/makerspaces, all of which constitute categories of innovation spaces, a more lively discussion has already taken place among practitioners and bloggers. The perhaps broadest and, in my opinion, most useful definition was provided by Christine Prefontaine, a consultant for technology, health, civil society and governance in the field of International Development, who is affiliated with the *Technology & Social Change Group* of the *University of Washington Information School* (Prefontaine, 2012). Her conceptualization has been made use of by a number of other researchers studying innovation spaces in the African context (Gathege & Moraa, 2013b; Moraa & Murage, 2012a, 2012b; Moraa, 2012, 2013) and is also deemed appropriate for this study. Prefontaine calls these spaces 'innovation spaces', because she experienced that they trigger innovativeness among their users ("Interview with Christine Prefontaine, 10 February 2014," n.d.) (compare Stercken, 2014). So what is understood by 'innovation spaces'? And, in that context, what is understood by 'innovation' or 'innovativeness', what by 'entrepreneurship'?

'Innovation spaces'

> "Innovation spaces are physical environments that promote community, learning, and making. They come in different flavors: Hubs, labs, libraries, hackerspaces, makerspaces, telecentres, coworking spaces[2]. Yet all provide opportunities to… (1) engage with people, ideas, and technologies, (2) experience participatory culture, and (3) acquire the literacies and skills needed to prosper in the 21st century" (Prefontaine, 2012) (compare Stercken, 2014, p.7).

'Innovation', 'innovativeness', 'entrepreneurship'

> "Innovation is conceptualized to comprise the first three elements in the range from (1) imagination, (2) creativity, (3) innovation, and (4) entrepreneurship. (1) 'imagination' refers to the idea of bringing to mind things that are not present for our senses. (2) 'Creativity' refers to the process of developing original ideas which have a value for the person developing them, the people surrounding them or society at large. (3) 'Innovation' denotes the actual implementation and putting into practice of these creative ideas. An innovation does not always have to be something radically new, but it can also include for instance implementing existing ideas in an unexpected manner or bringing them to a new place. (4) 'Entrepreneurship' refers to the ideas' commercialization. It is noteworthy that an 'innovation' and an 'invention' are two different things according to this definition, and that innovations do not have to be products that are commercialized through entrepreneurship. Rather, innovation is about the person who is being 'innovative', as s/he can be innovative in anything from a hobby to a way of doing business (Coward & Wijeweera, 2013a)" (compare Stercken, 2014, p.6).

Table 1. Definitions of those "flavors", referred to in Prefontaine's (2012) definition of 'innovation spaces', that are most relevant to this thesis. Adapted extract from Stercken (2014,pp.7-10)

Hub	The original meaning of the word 'hub' denotes a node in a network where many of the network tangents connect. *Google* defines the term as "the effective center of an activity, region, or network". In the innovation space context, the 'hub' term seems used rather vaguely with reference to the fact that a particular physical environment constitutes a meeting point for people who previously often do not know each other and experience moments of serendipity there. Besides, generally-speaking a 'business' component seems more frequent than a 'making' component among 'hubs' ("Interview with Christine Prefontaine, 10 February 2014," n.d.). Famous institutions which make use of the term 'hub' include the *Impact Hub*, a global network of coworking spaces with a social mission. Besides, Gathege and Moraa (2013a) make use of the term 'hub' in their study of various ICT-related innovation spaces across the African continent, which span from telecenters over coworking spaces to business incubators.
Lab	In general, the term 'lab' stands for laboratory and refers to an environment where ideas, products or services can be tested in a protected manner. While labs may in a sense be protected to the outside, inside there is usually a culture of 'open innovation', where ideas and knowledge are shared openly between its visitors who may previously be unfamiliar with each other, creating opportunities for feedback

[2] For definitions of those innovation space flavors that are most relevant for this master thesis, please read table 1.

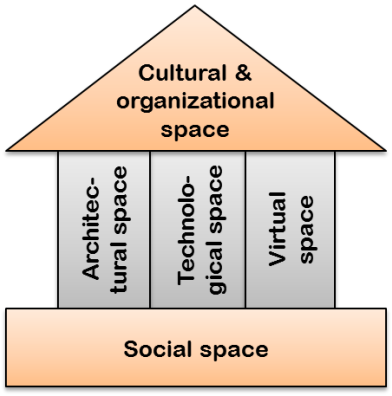
	and collaboration ("Interview with Christine Prefontaine, 10 February 2014," n.d.). An institution that is relatively well-known in the field which is known to make use of the 'lab' terminology is *AfriLab*s, a pan-African network that connects so-called 'tech labs' (technology laboratories), which are the same ones as researched by Hilda Moraa under the term 'ICT hubs' ("Labs," 2013). Another famous institution that makes use of the 'lab' terminology is the global movement of *Fab Labs* (fabrication laboratories), which was started by the *Massachusetts Institute of Technologies (MIT)*. In many ways, the principles and methods practiced at Fab Labs are indeed fairly congruent with those of hacker- and makerspaces, the difference being that the latter ones are usually not formally connected to the *MIT* network and are not required to adhere to the usage of the specific set of technology, promoted by *MIT/ Fab Lab* movement ("Interview with Christine Prefontaine, 10 February 2014," n.d.).
Hacker-space	Hackerspaces may take a wide variety of forms, as pointed out by the very broad definition given on www.hackerspaces.org: "Hackerspaces are community-operated physical places, where people can meet and work on their projects." What unites them, is that they host a community of enthusiasts, who often like referring to themselves as "hackers", "makers" or "tinkerers". While any thematic concentration is imaginable, many communities of users have a shared interest in technology, electronics, computers, robotics or industrial art. Also, the sharing of resources, including both low-tech tools such as hammer and nails and high-tech ones such as 3D printers or CNC milling machines, as well as knowledge-sharing and collaboration to build and make things are common to these spaces (Moilanen, 2012).
Maker-space	Makerspaces generally refer to the same ideas, principles and methods as hackerspaces, except that they circumvent the term 'hacker'. The reason for this rejection is that the term 'hacker' has gained a negative connotation in the last few decades, and been redefined as a person who illegally breaks into a computer system and steals valuable information, codes or destroys online projects. However, this connotation diverges from its original meaning of a person who is an enthusiast and highly-recognized expert in a certain field, e.g. computers. People who refer to themselves as hackers typically differentiate between 'black hacks', using illegal methods and having bad intentions, and 'white hacks', which are legal and may often indeed contribute to the security of online projects ("Interview with Christine Prefontaine, 10 February 2014," n.d.).
Co-working space	Coworking spaces are shared workplaces for independent professionals, start-up entrepreneurs or anyone with workplace flexibility, from a wide variety of professional backgrounds, who prefer working together over working alone. While the specific value proposition and focus of individual coworking spaces varies, many spaces comply with and promote the five core values[3], namely collaboration, openness, community, accessibility and sustainability, set forth by the movement's founders ("coworking wiki - our values," n.d.). The public nature and promotion of these values is what distinguishes coworking spaces from other workplace concepts, such as office rentals and business incubators, for which for instance community-building is not essential ("Interview with Christine Prefontaine, 10 February 2014," n.d.).

[3] What these different values entail is elaborated in section 3.1.2.

3.1.2 Conceptualization of 'innovation spaces'

In part 1 of this study, 'innovation spaces' have been conceptualized as **five highly interrelated 'space' dimensions** (compare figure 1) that have an 'enabling' impact on users, in particular in terms of facilitating knowledge-creation and innovation, which as an end result may contribute to bringing about "profound, radical and sustainable innovation" (Peschl & Fundneider, 2012, p.41)[4] (compare Stercken, 2014a).

Figure 1. Conceptualization of an innovation space, acc. to Stercken (2014)



(Author's illustration)

In this context, as related to Peschl & Fundneider's (2012) conceptualization of 'enabling spaces', the term **'enabling'** is used as opposed to that of 'managing'/'controlling'. The purpose is to stress that "game-changing or radical innovations" cannot be fostered through a managing/controlling attitude which classically seeks to maintain stability, established routines and processes. As "profound, radical and sustainable innovations" at their core aim to destroy or destabilize such routines, a managing approach is bound to fail. This is why an 'enabling' attitude should be chosen to foster them. Such an attitude requires on the one hand abandoning the regime of management and control, while on the other hand still "providing a set of constraints or a facilitating framework supporting the process of bringing forth new knowledge" (Peschl & Fundneider, 2012, p.45). '**Space'** is understood as a container that can provide these types of facilitating constraints, according to Peschl & Fundneider (2012) (compare Stercken, 2014).

The **five space dimensions** that were found to be elementary elements of innovation spaces are (1) architectural space, (2) technological space, (3) virtual space, (4) social space, and (5) cultural and organizational space (compare figure 1) (Stercken, 2014). For the reader unfamiliar with part 1, these elements are re-explained in table 2.

[4] This conceptualization was made in adaptation of Peschl & Fundneider's (2012) theory on 'enabling spaces', incorporating Prefontaine's (2012) aforementioned definition, as well as findings by Gathege & Moraa (2013).

Table 2. Conceptualization of the five innovation space dimensions, according to Stercken (2014)	
Architectural Space	The **'architectural space'** constitutes the physical environment which people can visit, experience and, in Prefontaine's (2012) words "get involved with people, ideas and technologies" inside of. It refers both to the built structures and to the design of the physical environment, which can have an enabling impact on users, by being stimulating in itself, by promoting the interaction between users, and/or by promoting the interaction of users with technologies (Peschl & Fundneider, 2012).
Technological space	The **'technological space'** refers to a range of low- to high-technologies that may be provided at an innovation space. Low-technologies include things like whiteboards or flipcharts; high-technologies include computers, internet, simulation and prototyping technologies, like carpentry tools, 3D printers and CNC machines. These can be enabling by supporting their users with new ways to obtain and structure knowledge (Peschl & Fundneider, 2012).
Virtual space	The **'virtual space'**, composed of elements such as online platforms or electronic blogs, provides an additional setting in which innovation space users can interact, this time in a non-face-to-face manner. The virtual space can not only be enabling by supporting physical encounters, it also provides opportunities to access additional knowledge sources (Peschl & Fundneider, 2012).
Social space	The **'social space'** dimension can be regarded as the "social container" (Peschl & Fundneider, 2012, p. 50) in which social groups interact. In the innovation space context, these social groups are usually referred to as 'communities' (Gathege & Moraa, 2013a; Prefontaine, 2012). As the community usually constitutes the basis of innovation spaces, it is depicted as the foundation of the innovation space "house" in figure 1. The community encompasses a fluctuating and usually growing number of individuals who use, co-create and sometimes even co-own the innovation space. These individuals typically come from different professional backgrounds and work on different projects, but they are united in their usage of the innovation space as a place "to engage with people, ideas and technologies" (Gathege & Moraa, 2013a; Moraa, 2012). A social space is deemed particularly enabling when a lot of social interaction, networking and collaboration takes place, especially between people who typically previously do not know each other. For that purpose, a social atmosphere is essential. Trust, dialogue and openness constitute key social enablers (Peschl & Fundneider, 2012).
Cultural and organizational space	The **'cultural and organizational space'** can be considered as the "roof" of innovation spaces (compare figure 1), in the sense that it provides cultural and organizational structures, including a set of shared values and principles, that guides the practices at the innovation spaces (Peschl & Fundneider, 2012). Flat hierarchies, transparency and corporate openness are deemed particularly enabling by Peschl & Fundneider (2012). In the innovation space context, the fact that they actively "promote community, learning and making" is considered as of even greater importance (Prefontaine, 2012) (compare Stercken, 2014). Concretely, six values and principles (A-F) have been identified in part 1 that are essential for innovation spaces. These are (A) collaboration, (B) openness, (C) community, (D) accessibility, (E) sustainability, (F) hands-on imperative and promotion of a 'hacking/making/do-it-yourself (DIY) culture' (compare Stercken, 2014). (A) **'Collaboration'** or sharing refers to the provision of a high-contact environment, where space and tools are shared, where doors are typically not closed and users can approach each other when they need help or feedback for

	something. Thus, also information and knowledge are shared, and in some cases, completely collaborative projects come about through serendipitous encounters at these innovation spaces ("coworking wiki - our values," n.d.). (B) **'Openness'** refers to the freedom/flexibility innovation spaces offer to their users, in the sense of allowing them to come whenever they want to and e.g. pay by usage. Besides, the principle of openness relates to the idea that users are free to co-create the (i.a. architectural) space according to the community's shared or users' individual needs ("coworking wiki - our values," n.d.). (C) **'Community'**, and thus the emphasis on the people/users, their interactions and relations (social space), rather than on e.g. the technologies provided, stands at the center of all innovation spaces. As every user gives his/her own flavor to the community, no two communities are identical ("coworking wiki - our values," n.d.). While hacker ethics do not explicitly mention community as a value in their hacker ethics, it nevertheless stands at the core of the hacker-/makerspace concept (Schlesinger, Islam, & MacNeill, n.d.). (D) **'Accessibility'** generally relates to the idea that innovation spaces should be accessible to anyone who wants to be part of the space and feels at ease with the values and principles practiced there. Access and usage should not be restricted, as is the case for otherwise somewhat related concepts like business incubators, where members are hand-selected. Also, innovation spaces should be accessible to anyone independent of their professional or social background, origin, sex and the like ("coworking wiki - our values," n.d.). Hacker-/makerspaces, tend to go a step further in their promotion of accessibility than coworking spaces, by additionally promoting the free access to computers and information. Relatedly, hackers/makers are typically fervent supporters of the open source movement (Schlesinger et al., n.d.)). (E) **'Sustainability'** – the fifth value – is interpreted rather diversely by the global coworking movement. In general there is the idea that the practice of sharing space, tools and resources in itself constitutes a more sustainable work model than if every user had his/her own office or workshop. Some innovation spaces promote ecological sustainability beyond that. Apart from that, many innovation spaces name the achievement of financial sustainability as key to sustainability. After all, in the end, every innovation space can only persist if it is able to maintain itself financially over time. Therefore, appropriate income streams are necessary ("coworking wiki - our values," n.d.). For hackerspaces, sustainability is typically related to decentralization, independence and a distrust of authority (Schlesinger et al., n.d.). (F) The hands-on imperative and promotion of a **'hacking/making/do-it-yourself (DIY) culture'** is a principle that hacker-/makerspaces promote more strongly that coworking spaces. The idea behind this principle is that by taking things apart, lessons can be learned about systems and about the world. Based on the knowledge gained, these things can be improved and other things can be built, thereby contributing to "world improvement" (Schlesinger et al., n.d.).

3.2 Global context

To begin with, it seems worth pointing out that, just as in part 1 of this study, the focus of this master's thesis also lays on **"emerging" innovation spaces**. Emerging innovation spaces are defined, according to Audette-Chapdelaine (2011), as those innovation space "flavors" that have historically emerged in the last 10-20 years, i.e. in particular "coworking spaces" (which are often also referred to as hubs) and "Fab Labs" (which are by extension congruent with hacker-/makerspaces)" (Stercken, 2014, p.11).

Historically, the innovation space movement can be said to have started in Europe and North America, with *C-Base* founded in 1995 Berlin commonly regarded as the first "hackerspace" worldwide, and what was later named the *Hat Factory* founded in 2005 San Francisco regarded as the first "coworking space" that called itself that way ("A History of Coworking in a Timeline," 2014). Since then, both movements have spread globally. To provide some numbers, in May 2014, Hackerspaces.org listed 1762 hackerspaces worldwide ("List of Hacker Spaces," 2014). Last updated in February, 2013, Deskmag reported 2490 coworking spaces, serving more than 110,000 coworkers all over the world (Foertsch, 2013). While most innovation spaces operate as individual hubs for their local communities, there are also several global franchise networks, such as the Massachusetts Institute of Technology (MIT)-based *Fab Lab* network, the (social) *Impact Hub* network started in London, or the *Seats2Meet* network, rooted in the Netherlands. Besides, several global online communities, like the *coworking wiki*, *www.hackerspaces.org* and *Deskmag* came up to cater to these types of innovation spaces. "Bar camps"[5], "jellies"[6] and "hackathons"[7] are some common forms of gathering that take place inside these emerging innovation spaces (Stercken, 2014).

While the large majority of the hacker-/makerspaces/fab labs as well as coworking spaces/hubs can still be found in Europe and North America, these types of innovation spaces recently began to spread in the so-called Global South. Like in Europe and North America, most of the innovation spaces in Africa, Asia and Latin America seem to be founded by grassroots groups of individuals, who are typically

[5] 'Bar camps' are ad hoc "unconferences" that include discussions, demonstrations and interactions, where participants can spontaneously bring up and deal with any topic they wish ("A History of Coworking in a Timeline," 2014) (compare Stercken, 2014).

[6] 'Jellies' are informal open meetings organized to allow for the exchange of ideas without commitments or costs, typically organized at coworking spaces ("A History of Coworking in a Timeline," 2014) (compare Stercken, 2014).

[7] 'Hackathons', sometimes also called makeathons, are common events especially at hackerspaces, makerspaces and fab labs. In these events, a group of people gathers to engage in collaborative software programming or in collaboratively building (aka hacking, making or sometimes crafting) hardware. The things hacked or made at hackathons/makeathons can be completely new, adaptations of existing technologies or replications of things already built elsewhere, about which participants often know from global commons-based peer production websites like e.g. *www.instructables.org* (Stercken, 2014).

involved with personal fabrication, freelance work and/or entrepreneurship (Agrivina, Agustini, Bastawy, & Druga, 2014; Akinyemi, Fajardo, Gutierrez, & Knight, 2014). To date, more than 100 innovation spaces already exist on the African continent and on average a new one is opened somewhere every second week ("About Us," 2014).

As explained in Stercken (2014), the innovation space movement needs to be seen in the wider context of the social and economic dynamics of the Information Age, including the rise of what Manuel Castells (2010) calls **'network society'** and defines as "a society where the key social structures and activities are organized around electronically processed information networks" (Kreisler, 2001, p.4). Castell's (2010) argumentation goes that, because information and communication technologies (ICTs) nowadays enable almost instantaneous flows and exchanges of information, capital and communication, the economy has become ever more globalized and social networks have multiplied in complexity, reach and importance. Amongst other things, the globalization of trade and of financial flows has led to economic uncertainties, which companies and organizations can only deal with through agility and adaptability. This led to a shift away from rigid hierarchical, industrial and bureaucratic companies and organizations, to ones that use leaner production methods and have more flexible relations to labor. In this context, individualized independent knowledge workers have become important. These knowledge workers are expected to bring forth innovation and deal within the complex social networks on demand, as freelancers. To give an example, in the network society, the one-(wo)man-company has gained in importance, who works on her/his own, but when commissioned a large project, makes use of her/his network, to pull together a team to work on that project. After the project is completed, this team falls apart again, and a new one may be built up for the next project (Castells, 2010) (compare Stercken, 2014).

The rise of innovation spaces is driven by various aspects related to the rise of the network society. First of all, innovation spaces primarily cater to the needs of **independent knowledge workers** in the network society: Especially coworking spaces, but also the other innovation space formats, provide relatively low-cost, flexible workspaces where knowledge workers can go to work on their individual projects, while cultivating their social and professional network (Coward & Wijeweera, 2013b; Johns & Gratton, 2013). Secondly, innovation spaces constitute places where many **new technologies** that have given rise to the network society in the first place are embraced, made use of and promoted. This includes the World Wide Web as such, through which much of the knowledge work is done. More specifically, it typically also includes social media and other many-to-many communication technologies[8], free and open-source[9]

[8] 'Many-to-many communication technologies', such as social networking systems like Facebook, allow multiple users to interact with multiple others. They thus stand in contrast to e.g. traditional one-to-many communication technologies, such as the television, where one source is

software projects as well as commons-based peer production[10] technologies (Coward & Wijeweera, 2013b; Troxler, 2010). Thirdly, the rise of innovation spaces needs to be seen in the context of a **rising concern for sustainability**, especially among many knowledge workers, who often want to create value by sharing knowledge and tools, and collaborating with others, rather than be guided by competition logics and economic growth per se (Coward & Wijeweera, 2013b; DeGuzman, Tang, & McKeller, 2011; Van den Hoff, n.d.) (compare Stercken, 2014).

3.3 Regional context and case studies

This subsection first briefly summarizes the most relevant factors concerning the regional context in which Caireen innovation spaces emerged. It then presents the ten case studies and how they tie into this regional context. In that sense, this subsection draws directly on the findings from part 1, which dealt with the overarching research question, "*How do Caireen innovation spaces seek to foster their users' innovativeness and contribute to local development?*"

3.3.1 Egyptian context

In general, it can be said that Egypt is marked by a **long history of foreign domination**. Over the centuries, almost every Mediterranean and Middle Eastern civilization invaded and tried to conquer Egypt. Consequently, during long periods of time, the country's resources were used in the interests of foreign rulers; Egyptians were degraded to second-class citizens, and there was little effort in favor of development and betterment for Egyptians themselves. From 1882 until 1953, Egypt was a puppet of British occupation: While developing into a regional commercial and trading destination, the vastly inflowing immigrants held the dominant positions and were the main beneficiaries of Westernizing modernization (Osman, 2013) (compare Stercken, 2014).

Yet, two periods in history stand out where Egypt tried to embark on a **locally-driven Egyptian development project**. These were led respectively by Khedive

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transmitted to many users, without them being able to communicate back or with each other through the same communication channel (Coward & Wijeweera, 2013b).

[9] 'Open source' refers to a movement that promotes the universal access to and redistribution of a product's design or blueprint via free license, while encouraging subsequent improvements to be made to this design or blueprint by anyone (Troxler, 2010) (compare Stercken, 2014).

[10] 'Commons-based peer production' refers to the collaborative production of cultural content, knowledge, information and indeed physical goods. Commons-based peer production technologies include things like 3d printers and CNC milling machines (Troxler, 2010) (compare Stercken, 2014).

Mohamed Ali (1805-1849), who ruled Egypt before the British occupation, and by President Gamal Abdel Nasser (1956-1970), who had been one of the leaders of the military coup d'état in 1952 that ended British occupation and abolished constitutional monarchy. Both periods were managed in a top-down manner by the government and were accompanied by the creation of a large bureaucratic state apparatus, the rise of the military complex, a situation of almost full employment, the introduction of social welfare services, including free education under Nasser, and the formation of a broad middle class. Consequently, these times are cherishingly remembered by certain parts of Egyptian society nowadays. These same parts of society typically also consider the state as ideal employer, despite (nowadays') meager payments, and see it as the role of the state to improve their living conditions, as it had once done under Nasser (de Koning, 2005; Osman, 2013) (compare Stercken, 2014).

When the Nasserite system failed, not least due to population explosion, the **economy was liberalized** and **social disparities** grew. Under the name of *infitaah*, 'opening', President Anwar Sadat's regime (1970-1981) sought to create an environment that would attract international investment, provide the necessary freedom for the local private sector to flourish and further encourage collaborations with foreign companies. This state-fostered capitalism gave rise to a stratum of nouveaux riches, often top-level bureaucrats who made use of their control of state enterprises to ensure an advantageous starting position in the new private sector. At the same time, inflation began to erode the incomes of the bulk of salaried workers in Egypt. Once again Egypt became heavily reliant on external resources, including worker remittances, tourism, oil, the Suez Canal and foreign aid (de Koning, 2005) (compare Stercken, 2014).

When revenues fell in the 1980s and foreign debts rose to such an extent that debt servicing became threatening, the regime of President Hosni Mubarak (1981-2011) was finally forced to accept the *World Bank/International Monetary Fond's (IMF)* extensive **structural adjustment programs** (SAPs). These included measures of financial austerity, exchange rate depreciation, elimination of price controls and subsidies, public sector reform and privatization – aimed at transforming Egypt into a liberal market economy and integrating it into global economic networks. While the economy recovered in the aftermath of the IMF reforms and the state rolled back further and further, development became a task for the private sector and civil society organizations (El-Sharnouby, 2012) (compare Stercken, 2014).

Parallel to the supposed economic success, Egypt's **youth bulge** developed into an increasingly serious social problem from the 1980s onward (El-Sharnouby, 2012). As Egypt's population had roughly tripled from about 28 million in Nasserite 1960, over 46 million at the beginning of Mubarak's rule in 1981, to 81 million in 2011, the labor market could not absorb the rapidly growing number of job-seekers. Public education services

were overwhelmed with the inflow of students as well ("Egypt - Population," n.d.; El-Sharnouby, 2012). Unable to afford good education, employment or marriage, many youth were left in a state of waiting to become full adults, while remaining financially dependent on their families (El-Sharnouby, 2012) (compare Stercken, 2014).

Especially the growing cohort of unemployed youth came to be viewed as considerable problem, which was sought to be tackled by encouraging young people to become entrepreneurs and by occupying them in civil society organizations. During this dilemma, a dualistic vision of youth arose. The well-educated upper middle class youth was regarded as "the future of the country", while the less well-educated lower middle class and lower classes in general were viewed as an apathetic, potentially dangerous mass (El-Sharnouby, 2012) (compare Stercken, 2014).

Indeed, as a result of eighteen days of mass uprisings from **25 January 2011** onward, in a joint effort, parts of the Egyptian society, largely led by young people, managed to overthrow Mubarak's regime and end three eras of military-led rule. In the aftermath of the revolution, youth were suddenly celebrated as heroes. As a consequence of the success of the revolution, many (young) Egyptians felt empowered and motivated to contribute to the development of their country: They began to start their own projects, engage into freelancing and entrepreneurship, into youth-led activism, civil society or political organizations (El-Sharnouby, 2012). During this same period, most of the innovation spaces that are studied under the scope of this research project were founded. While the Morsi regime was overthrown following the public protests of 30 June 2013 and an accompanying military coup, the field work for this study was conducted during the rule of Mohammed Morsi and his cabinet, affiliated to the Muslim Brotherhood (compare Stercken, 2014).

In general, it can be said that Egypt has been in a **transition period** ever since the revolution of 2011. This transition phase has been characterized by high levels of uncertainty and a very challenging macroeconomic situation, with a widening government budget deficit, rising public indebtedness and persisting inflationary pressures (Drzeniek Hanouz & Dusek, 2013) (compare Stercken, 2014).

3.3.2 Innovation spaces in Cairo

The Egyptian innovation space scene first emerged in Greater Cairo, one of the largest and most densely inhabited metropolitan areas in the world, hosting a total population of about 20 million inhabitants (El-Sadek, 2011). The first coworking space that still exists today is *Rasheed22*, and was slowly and gradually started in 2007/2008. The first hackerspace community was that of *Cairo Hackerspace*, started in 2009. However, the large majority of innovation spaces only emerged after the Egyptian revolution of January 2011, including *The District* and *Mesaha* at the end of 2011, *Fab Lab Egypt*, *302*

Labs, *icecairo*, and *Almaqarr* throughout the year of 2012, and *Beit ElRaseef* and *Qafeer Labs* by the second quarter of 2013, when fieldwork was conducted (compare Stercken, 2014).

By comparing and contrasting these ten case studies, part 1 of this research project showed that the emergence of innovation spaced in Cairo is on the one hand related to the contextual drivers of the global innovation space movement outlined in section 3.2. On the other hand, it needs to be seen in the context of the local socio-political and economic developments of Egypt outlined in the previous section.

While all aforementioned **drivers of the global innovation space movement**, i.e. the changing nature of work, the changes in technology and the rising concern for sustainability, were found to be relevant drivers in the Egyptian context as well, it was also pointed out that most of these changes are still in their infancy in Egypt. In this sense, it cannot be said that the Egyptian innovation spaces served a large pre-existing market in the second quarter of 2013, when fieldwork was conducted. Yet, most of the founders/managers of the Caireen innovation spaces seem to belong to that young, highly educated, cosmopolitan, moderately wealthy and increasingly pro-active Egyptian upper middle class that is at the forefront of the changing nature of work, use of new technologies and rising concern about sustainability. The same can be said about the majority of users of the Caireen innovation spaces (Stercken, 2014).

Most of the founders/managers became aware of the need for innovation spaces, due to their own existing or past needs as coworkers, freelancers, student activists, NGO members, hobbyists and/or professional hackers/makers. While some were motivated to found such spaces to fulfill their personal needs, almost all of them seek to **foster one or multiple types of local development**: They want to bring forth local innovation, whether of technological, business, social, ecological or cultural type, foster a DIY culture, promote a consciousness for sustainability, support youth-led activism and/or encourage various types of entrepreneurship and employment. In other words, in different but related ways, most of them aim to contribute to bottom-up, Egyptian and often youth-led sustainable development (Stercken, 2014). For a better overview of the ten case studies, their main characteristics in terms of foundation, type of innovation space and mission, please consult table 3.

In some ways, it can be said that the newly emerging innovation spaces fit into Egypt's predominant **neoliberal paradigm**, which encourages entrepreneurship to foster economic growth and civil society activities to foster social development. Yet, in others, their emergence can be seen as a fairly **new phenomenon** in an Egyptian society, which has for sixty years been dominated by a massive centralized bureaucratic state apparatus and military complex. After all, innovation space founders' ambitions include becoming independent from the longstanding trend of foreign domination and from national top-down rule by developing locally-inspired and locally-produced innovation,

of whatever type, in a bottom-up manner. In addition, innovation spaces support and promote new forms of employment that go against the old but persisting ideal of employment through the state bureaucracy and against the new ideal of working for large international companies. Finally, to a large extent, innovation spaces target young people, i.e. a group of people that had formerly been perceived as apathetic but has become increasingly proactive as entrepreneurs or youth-activists – both movements which reached considerable momentum with the revolution of 2011 (Stercken, 2014).

The way in which founders/managers seek to achieve these developmental impacts is through the **innovation space format**, which was introduced in section 3.1.2. This means that Caireen innovation spaces indeed variously integrate architectural, technological, virtual, social and cultural and organizational space dimensions, in such a way that interaction, networking and collaboration are facilitated, knowledge processes and innovation creation stimulated (Stercken, 2014). For a better overview of how the ten case studies implement the innovation space format, please consult table 4. Thus, since Caireen innovation spaces clearly *seek* to have a developmental impact according to the innovation space founders/managers, it becomes interesting to analyze in how far they actually manage to reach their aims.

Table 3[11]	Self-description	Started in/by	Main category	Innovation type	Mission
Al-maqarr	"coworking space supporting entrepreneurs, student initiatives, NGOs and others with a community of innovation and collaboration"	2012 By 4 former student activists	Event/ meeting space	Social & eco-logical	+ Support student activists, NGOs, entre-preneurs & freelancers + Promote entrepreneurship
Beit ElRaseef	A space to promote personal and cultural development in Egypt	Beg. 2013 By 10-15 Horgat & Elraseef supporters	Event/ meeting space	Cultural & social	+ Promote cultural development + Promote personal creativity + Support student activism & NGOs
Cairo Hacker-space	"A place where everyone in Egypt can share his projects, learn, collect a team for his project"	2009 By 5 friends, hackers	Hacker-/ maker-space	Techno-logical	+ Support hacker/ maker community + Promote hacking/making/DIY

[11] Table 3 constitutes an extract from Stercken (2014, pp. 57-58); the pictures depicted in this table constitute the logos of the respective innovation spaces, who own the rights to these.

Table 3 (cont'd)	Self-description	Started in/by	Main category	Innovation type	Mission
The District	"inspiring coworking space for game-changing entrepreneurs and freelancers"	2011 By 2 entre-preneurs	Co-working space	Business	- Support entre-preneurs & freelancers - Promote entrepreneurship
Fab Lab Egypt	"A space where we can collaborate on projects, support people and have a space open to everyone, to come and collaborate and share knowledge"	2012 By several hackers/ makers	Hacker-/ maker-space	Techno-logical	- Support hackers/makers - Promote hacking/making/DIY
Icecairo	"green technology innovation hub, a community of individuals with innovating ideas, working on local solutions to local & global challenges"	2012 By a large develop-ment cooperation organization	Mixed: meeting space, hacker-/ maker-space	Social, eco-logical & techno-logical	Support & promote - youth employment - entrepreneurship - hacking/making/DIY - development of local tech innovations →in green sector
302 Labs	"community hub for early stage startups and freelancers"	2012 By 2 freelance friends	Co-working space	IT	- Space for entrepreneurs & freelancers
Mesaha	"supportive space for youth-led initiatives and community-development"	2011; By 8 former student activists	Event/ meeting space	Social & eco-logical	- Support student activism & NGOs - Support community development
Qafeer Labs	"startup that supports entrepreneurs to build successful startups in 6 October City"	Beg. 2013 By 2 entre-preneurs	Co-working space	Social & eco-logical	- Promote entrepreneurship - Promote the development of local innovations
Rasheed 22	"family-friendly coworking space with a mission"	2007/2008 By 1 entre-preneur	Co-working space	Social & eco-logical	- Support entre-preneurs & freelancers - Promote sustainable work style

Table 4[12]	Architectural space	Technological space	Virtual space	Social space	Cultural & organizational space
Al-maqarr	-1 apartment in Heliopolis -4 rooms for meetings & coworking, 1 reception area, lobby, garden, 1 fully equipped kitchen -Gradually furnished & decorated by founders	Internet, multimedia display system, printer	FB page, FB group, Twitter, news-letter, website, Linkedin	A multitude of student initiatives with social or ecological mission and NGO groups	- Community - Collaboration - Sustainability - Accessibility - Openness
Beit ElRaseef	-1 apartment in Maadi -incl. large, open outdoor area with stage, bar, events/ meetings/coworking area, indoor room/area -Gradually furnished & equipped by members	Internet; musical instruments; projector	FB page, news-letter, website	Culturally creative individuals, activist groups, NGOs	- Value & dignity - Community - Sustainability - Collaboration - Openness, unleash mind, co-creation, co-ownership - Accessibility
Cairo Hacker-space	-1 apartment in Maadi -incl. 2 rooms for hacking & coworking; 1 kitchen -Gradually furnished & equipped by founders/members	Internet, Makerbot 3D printer, Egg-Bot, basic electronic tools	FB page, website, a few videos on youtube	Mostly hobbyists, students, occasional freelancing	- Community - Collaboration - Accessibility - Openness, co-creation, co-ownership -Independence - Free & open-source access to information
The District	-2 apartments in the same building in Maadi -Incl. 9 rooms for coworking, meetings, events or socializing, 2 fully equipped kitchens -Carefully furnished, equipped & decorated by founders & managers	Highspeed internet; copy machine, printer, scanner, fax; multimedia display system; writing boards; small library	FB page, FB group, Twitter, Linkedin, e-mail news-letter;	A multitude of free-lancers & start-ups	- Community - Openness, co-creation - Sustainability - Collaboration - Accessibility
Fab Lab Egypt	-1 apartment in Dokki, Giza Governorate -incl. 2 large rooms for making, coworking or events -Furniture & design rather basic, acquired by founders and members	Internet, laser-cutter, 3D printer, CNC, electronics work station, PCs with design applications, shared workspace	FB page, FB group, Twitter, website incl. blog, youtube channel	Mostly hobbyists & students; some entre-preneurs or freelancers	- Community - Openness - Collaboration - Accessibility - Free & open-source access to information

[12] Table 4 constitutes an extract from Stercken (2014, pp. 79-81); the pictures depicted in this table constitute the logos of the respective innovation spaces and are trademarked by these.

Table 4 (cont'd)	Architectural space	Technological space	Virtual space	Social space	Cultural & organizational space
Icecairo	-1 apartment in Downtown Cairo -3 rooms for coworking, meetings & events -1 room as Fab Lab -Fully-equipped kitchen -Furnished, equipped & decorated by pro-fessionals paid by a large development coop-eration organization	Internet; 2 iMac's; copy machine, printer, scanner; LCD & display system; 3D printer, laser cutter, metal-forming CNC machine; writing boards	FB page, FB group, news-letter, website/ wiki, Twitter	Mostly students; some NGO workers, freelancers & entre-preneurs; most with previous interest in sustainability	- Community - Collaboration - Sustainability - Accessibility - Openness - Free & open-source access to information
302 Labs	-1 apartment in Nasr City -incl. 4 rooms for coworking or meetings, 1 veranda -Matching furniture & decoration, acquired by founders	Internet; copy machine, printer; (video) game console	FB page, Twitter, Linkedin	Mostly freelancers	- Community - Openness - Collaboration
Mesaha	-1 apartment in Abdeen/Downtown Cairo: -incl. entrance hall, 3 meeting rooms, 1 coworking room, 1 fully equipped kitchen -Gradually furnished, equipped & decorated by founders/members	Internet; Printer, whiteboards, books & magazines	FB page, FB group, e-mail news-letter	A multitude of student initiatives with social or ecological mission and NGO groups	- Community - Openness, co-creation, co-ownership - Sustainability - Collaboration - Accessibility -Independence
Qafeer Labs	-1 apartment in 6 of October City -incl. 1 large coworking area, 1 meeting room, kitchen/bar -Fully furnished, equipped & designed by founders	Internet; whiteboards	FB page, FB groups for spec. topics, website, Meetup page, Twitter, Linkedin	Entre-preneurs, some freelancers	- Community - Collaboration - Sustainability - Accessibility - Openness - Free & open-source access to information
Rasheed 22	-2 apartments in the same building in Heliopolis -incl. 8 rooms for coworking, meetings, events or for kids to play; 2 fully-equipped kitchens; 1 small garden -Gradually, diversely furnished equipped & decorated by members	Broadband internet; copy machine, printer; whiteboards, projector; landline phone, small library	FB page, FB group for all users, FB group for key-holders	Several small businesses & freelancers, multiple social initiatives	- Community - Openness, co-creation - Sustainability - Collaboration - Accessibility

4. Theoretical Framework for studying the Developmental Impact of Innovation Spaces

Due to the newness of the innovation space format, hardly any peer-reviewed academic literature can be found on the topic to date, much less about African innovation spaces and none at all about Egyptian or Caireen innovation spaces in particular. Therefore, it does not come as a surprise that literature about the impact of innovation spaces on their users and/or on local development is virtually non-existent. Nevertheless, several evaluation attempts have been made by innovation space practitioners as well as affiliated stakeholders. The first sub-section gives a brief overview of the most relevant approaches that have been taken so far. The second sub-section introduces Sen's capabilities approach as a theoretical framework for studying the developmental impact of innovation spaces. The third sub-section expands the capabilities framework through relevant insights from Management and Psychology, all of which are important for the conceptual framework that is going to be presented in the ensuing section 5.

4.1 Former approaches to studying the impact of related initiatives

Perhaps the most prominent study related to this topic was commissioned by *infoDev* and concerned the evaluation of *infoDev*'s "Mobile Innovation Support Pilots". In particular, the evaluation of the so-called 'mLabs' launched in Armenia, Kenya, Pakistan, South Africa and Vietnam, seems of relevance for this research. However, it needs to be pointed out that rather than 'innovation spaces', 'mLabs' constitute "specialized mobile business incubation and acceleration facilities, offering physical workspaces, mentoring and coaching, devices for app-testing, training, and startup competitions" (The World Bank, 2014, p.20). Consequently, the way in which their impact was measured corresponded largely to the common way of measuring the impact of business incubators or accelerators: The impact was evaluated mainly in terms of the number of individuals trained in mobile technology and entrepreneurship issues, the number of applications brought to market, how much revenue they generated and how many customers downloaded them, the number of startups created as well as the amount of investment the aggregate number of start-ups managed to attract (The World Bank, 2014a).

However, this evaluation did not generate the expected results. In fact, Friederici (2014) who had been highly involved by the aforementioned *infoDev* study, pointed out at the conference *Re:publica 2014*, that he believes that this approach possibly measured the wrong thing. When researching the accelerator-type-impact of the

mLabs, it quickly became clear that many of them had developed into different directions that originally planned. The directions they developed in was influenced by the mLabs' idiosyncratical local contexts and the variety of stakeholders, including entrepreneurs, students, technology companies, investors, foundations, government, doners, NGOs, etc. As a consequence, Friederici (2014) stresses the necessity to distinguish between three different models mLabs developed into: (1) start-up accelerators, (2) innovation-creators, and (3) ecosystem-builders.

In brief, he characterizes **'start-up accelerator' hubs** by a relatively narrow focus on start-up creation and development. Thus, they have a hand-selected number of clients who they help to build a prototype, attract investment and maximize revenue. **'Innovation-creator' hubs** by contrast are not so much about business acceleration and making money. Instead, their goal is to foster social entrepreneurship, so that the entrepreneurs bring forth innovations, which should be scalable and have an impact on deprived populations. Thus, the target of these innovation-creator hubs is the social impact on the users of the innovations, rather than on creating start-ups or training people. Lastly, **'ecosystem-builder' hubs**, while also about entrepreneurship, do not provide the classical accelerator services and they are less about directing people into the direction of developing certain types of innovation. Instead, it is their main goal to build and connect a sizable community of entrepreneurs, freelancers, etc., so that these can support each other in their efforts. Ideally, the community also includes other stakeholders, like investors, mentors, NGOs, technology companies, business angels, accounting service providers etc. Consequently, ecosystem-builder hubs are typically much more open and accessible to high amounts of individuals and teams than the other models; besides, they accept individuals at any stage of innovation. To get a basic ecosystem ready, so that everything else can fall into place, ecosystem-builders often try to enhance the skills and experience of their users to support them in their activities (Friederici, 2014).

According to Friederici (2014), although these three models do not rule each other out, they are still different and should be regarded as such, not only to ensure the right decisions in terms of how to measure impact, but also more generally for decision-making purposes of managers and other stakeholders involved in these spaces. For instance, a clear direction would facilitate the decision of whether or not to partner with a certain donor or technology company and accept all the conditions that come with this partnership (The World Bank, 2014a). At *Re:publica 2014*, Friederici (2014) mentioned that he mainly saw the potential for those technology hubs and innovation spaces represented at the conference[13], in the role of ecosystem-builders. However,

[13] Amongst others, there two innovation spaces studied under the scope of this research were represented at this conference, namely *icecairo* and *The District*.

unfortunately, Friederici (2014) did not have the chance to systematically analyze this impact so far.

Apart from Friederici, Hilda Moraa (2013), a researcher affiliated to the research branch of the aforementioned innovation space *iHub*, in Nairobi, Kenya, has also studied a number of what she calls 'ICT Hubs' throughout sub-Saharan Africa. Among her collection of (non-peer-reviewed) case study-based research reports, one study can be found that is dedicated to exploring the impact of the innovation space *ActivSpaces* on its entrepreneurs. Moraa (2013, p.10) describes *ActivSpaces* – which stands for 'African Center for Technology, Innovation & Venture Spaces' – as an "open collaboration physical space, innovation hub, and technology incubator aimed at providing coaching services and development resources for start-ups and young techies in Cameroon". Through qualitative research methods, including in particular 12 short interviews with its users, and participant observation, she found that *ActivSpaces* constitutes a step into the right direction for **tackling** the Cameroon's problem of **youth unemployment** that concerns mainly young people under 30 years old who hold university degrees. Concretely, Moraa (2013, p.17) found that the young, well-educated users most appreciated about their innovation space (from most to least frequently named): idea-sharing (incl. meeting & sharing ideas with people in the same field, learning new techniques from other members, sharing talent), networking (contacts acquired through networking), new opportunities (help grow ideas, self-employment opportunities due to projects at *ActivSpaces*, meet new people & get assistance), collaboration (diversity & meeting people you can work with), free internet, access to a pool of experts, mentoring, good atmosphere, free office space. Apart from that, 11 out of the 12 interviewed members indicated that *ActivSpaces* had contributed to the improvement of their skills in the following way: "helped in being self-motivated through self-learning", "helped me to be creative", "networking opportunities", "growth of knowledge", "learn more on project management", "presentation skills", "learnt new programming languages", "collaboration", "practical skills" (Moraa, 2013, p.23).

Lastly, the approach of the coworking magazine *Deskmag* seems of interest. By means of an annual global coworking survey, *Deskmag* collects a large amount of quantitative data on coworking spaces, i.e. one specific type of innovation spaces. For the purpose of the impact question, in particular the 3rd global coworking survey is of interest, which was conducted in the year of 2012 and had 2,007 respondents from North and South America, Europe, Asia, Australia and Africa. It asked subjective quantitative questions about the **impacts** the coworking space has **on both coworkers and managers** of coworking spaces. These questions were firstly concerned with inquiring how much their work style had altered since they work in a coworking space (with respect to ideas relating to business, creativity, ability to focus, completing tasks in a given time, standard of working) and secondly how much the coworking space had

impacted them as persons (with respect to their social circle, business network, productivity, self-confidence, updated skill set, relax at home, skill set, health, private life, team work, income, company size, less isolated) ("1st Results of the 3rd Global Coworking Survey," 2012). The results of the Deskmag survey that are most relevant to this study are summarized in tables 5 and 6.

As has become apparent, all of these studies stem from innovation space practitioners or affiliated stakeholders. None of them can be regarded as peer-reviewed academic contributions; none of them explicitly define what they mean by "development"; and none of them speak of underlying academic theories. Yet, in different ways, they look at certain factors that could be considered as measures of developmental impact.

Table 5. Extract from the results of Deskmag's 3rd global coworking survey[14]

Q: How much has your work-style altered since you work in a coworking space?	++/+	0	-/- -
Ideas relating to business	74%	24%	2%
Creativity	71%	26%	3%
Ability to focus	68%	30%	12%
Completing tasks in a given time	64%	28%	8%
Standard of work	62%	35%	3%

Table 6. Extract from the results of Deskmag's 3rd global coworking survey[15]

Comparison of the positive impacts on…	**Coworkers** ++/+	**Operators** ++/+
Social circle	86%	93%
Business network	80%	94%
Productivity	74%	79%
Self-confidence	71%	81%
Updated skill set	55%	81%
Relax at home	71%	48%
Skill set	63%	90%
Health	53%	48%
Private life	54%	51%
Teamwork	45%	51%
Income	37%	46%
Company size	12%	38%
Less isolated	90%	91%

[14] Table 5 was compiled based on the graphs presented on http://www.deskmag.com/en/1st-results-of-the-3rd-global-coworking-survey-2012

[15] Table 6 was compiled based on the graphs presented on http://www.deskmag.com/en/1st-results-of-the-3rd-global-coworking-survey-2012.

4.2 Defining development: The human development and capability approach

For the purpose of this thesis, **'development'** shall be defined, according to Sen's (1999) 'human development and capability approach', as **the expansion of the capabilities of people to lead the kind of lives they value**. Several things are noteworthy about this definition and approach. Firstly, it disregards traditional development economists' focus on economic growth as the end to development. Instead, it proposes that the objective of any development effort should always be human development, as defined above, with economic growth as but one out of several potential means to reach that objective. Secondly, when evaluating human development, the approach proposes to look both at the kind of lives people lead and at in how far they have the freedom to decide upon how they want to live (Sen, 1999).

In this context, several concepts become of relevance. On the one hand it is important to look at what Sen calls **'functionings'**, i.e. "the various things a person may value doing or being" (Sen, 1999, as cited in Alkire, 2005). While Sen rejects the identification of one rigid set of functionings, suggesting that the relevant functionings may vary across time, culture and topic, it seems worth mentioning that functionings can be of physical, mental or social type. To provide some examples, functionings could include things as varied as health, knowledge, self-confidence, friendship, and employment. However, as Sen explains, not only the functionings people actually achieve are important, but also that people have the **'freedom'** to choose which functionings they want to achieve. Therefore, not only functionings, but also or even more so, **'capabilities'** are of importance. In essence, capabilities can be seen as a set of functionings that people value and have the freedom to choose from (Alkire, 2005a).

The role Sen (1999) attributes to capabilities cannot be under-estimated. On the one hand, he stresses that human capabilities are (1) of direct relevance to human well-being and agency. In this context, **'human well-being'** is largely determined by capabilities ranging from elementary ones, like nutrition or access to clean water, to complex ones, like self-esteem or social support. On the other hand, **'human agency'** refers to a person's ability to pursue his/her goals that lie outside of his/her direct well-being, but may include things like getting funding for building a new school or starting a business. Therefore, agency may require different capabilities than well-being, including perhaps capabilities like being well-educated and having the right social connections. Besides, Sen (1999) points out that human capabilities additionally play an indirect or instrumental role in influencing (2) **social change** and (3) **economic production**. Social change and economic production then again contribute to human well-being and agency (Sen, 1999).

Related to these different concepts, Sen proposes that, when analyzing human development, four different things may be of evaluative interest: (a) 'well-being

achievement', (b) 'well-being freedom', (c) 'agency achievement' and (d) 'agency freedom' (Sen, 2008).

So, how does this relate to the topic of innovation spaces? In this master's thesis, two research questions are analyzed, both of which relate directly or indirectly to the conceptualization of development as the expansion of the capabilities of people to lead the kind of lives they value.

The first research question analyzes how innovation spaces have an impact on their users' capabilities and in how far the newly-learned or improved capabilities have an impact on their users' agency freedom as well as agency achievement. Although the impact on users' well-being will also play a certain role in this context, the focus lays on agency rather than on well-being (Stercken, 2014). Besides, as both Moraa's (2013) and Deskmag's ("1st Results of the 3rd Global Coworking Survey," 2012) aforementioned approaches can be said to deal with the question of capabilities expansion, their methods and results have been taken into account for this study's methodology and discussion of results. The second research question focuses more on the second and third role of human capabilities, i.e. in how far these contribute to influencing social change and economic production, which could in turn have an impact on human development more broadly.

4.3 Extending the capabilities framework through insights from Management and Psychology: capitals and capabilities, efficacy beliefs and serendipity

To some extent, the concepts 'social capital', 'human capital' and 'psychological capital' are related to the Senian concept of capabilities, in the sense that they represent "various things that a person may value doing or being" and are of social or mental type. Apart from that, an individual may "choose" to make use of her/his forms of capital to achieve various ends. The difference between the concepts of capital and capabilities is that capital constitutes an economic term and unsurprisingly, the diverse forms of capital are typically discussed as means to reach the end of economic growth. For instance, 'capital' has been defined as "the resources withdrawn from consumption that are invested for future invested returns" (Luthans, Luthans, & Luthans, 2004, p.45).

This obviously contrasts quite starkly with the Senian idea that capabilities should be regarded as an end in themselves. Despite this non-negligible difference in focus, and without wanting to diverge too far from the Senian understanding of the value of capabilities to human development, I find it worthwhile to make an excursion into the literature on "capitals". The point is to gain a deeper understanding of the different types of capitals/capabilities that may be of value to individuals, while additionally contributing to social change and economic production.

One of the most encompassing discussions of the types of capital that humans can be endowed with, may be presented by Luthans, Luthans & Luthans (2004). Coming from the field of Management, these academics argue that four types of resources should be regarded as relevant to competitive advantage in today's global economy. The first type is **economic capital** and also constitutes the one that has traditionally received most attention in the field of Economics and Business. Economic capital is concerned with the question of "what you have" and includes financial assets as well as tangible physical assets, like plant, equipment, patents and data. The second type, which has also gained increasing attention, is **human capital**, aka **intellectual capital**. Human/intellectual capital refers to more intangible, mental things, like knowledge, education, experience, skills and ideas. It can thus be summarized under the header of "what you know". Thirdly, described as "considerably more subtle or intangible and difficult to measure", stands "the cousin of human capital" **social capital** (Luthans et al., 2004, p.46). Social capital concerns "who you know", i.e. people's network of contacts, their relationships and friends. Lastly, Luthans et al. (2004) draw attention to a forth type of capital that is commonly ignored and has only recently started to be acknowledged: **psychological capital**. While intangible, like intellectual and social capital, psychological capital refers to the question of "who you are". For competitive advantage, Luthans et al. (2004) stress the importance of what they call 'positive psychological capital', which includes "capabilities" such as confidence, hope, optimism and resilience.

According to Luthans et al. (2004), the idea of positive psychological capital is closely related to the concept of self-efficacy, as initiated by the influential psychologist Albert Bandura. In contrast to Luthans et al., Bandura (1997) indeed discusses his 'theory of self-efficacy', which he himself sometimes also refers to as 'theory of human agency', using the Senian language of capabilities. What Bandura (1995, as cited in Alkire, 2005, p.238) understands as **'self-efficacy'** can in essence be regarded as individuals' judgment of/beliefs in their own capabilities "to exercise control over their own functioning and over events that affect their life".

Self-efficacy theory posits that human agency is determined by internal as well as external factors. While the external environment, as well as people's own behaviors, put certain limitations on people's efficacy – I will come back to this point later –, the theory holds that the more self-efficacious concerning a certain activity people perceive themselves to be, the more motivated they are, the higher their effort and the higher their perseverance in undertaking that activity. In Bandura's (1995, p.2) words, "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively the case". In that sense, efficacy beliefs are highly influential in many different spheres of human functioning, including amongst others people's intellectual development (note the reference to intellectual capital/capabilities), their

building of social networks (related to social capital/capabilities) and their occupational development and pursuits (Bandura, 1995, 2001).

Next to self-efficacy beliefs, which are important for people's endeavors as individuals, Bandura (1995) points out the importance of **'collective efficacy beliefs'** for people's endeavors as a team or as a collective. For the field of health promotion, but similarly applicable in any other field where social change is sought to be brought about, Bandura (1995, p.33) defines a 'sense of collective efficacy' as "people's beliefs in their joint capabilities to make health promotion a national priority, to forge divergent self-interests into a shared agenda, to enlist supporters and resources for collective action, to devise effective strategies and to execute them successfully, and to withstand forcible opposition and discouraging setbacks" (Bandura, 1995, p.33). Besides, he reinforces that "[g]roup achievements and social change are rooted in self-efficacy" (Bandura, 1995, p.34). In that sense not only people's self-efficacy beliefs, which improve their various capabilities and heighten their performance in the projects they engage in, are of value. Rather, also people's sense of collective efficacy is important, because it motivates people to engage into collective action, persevere in the face of hurdles etc.

So if social capital, intellectual capital, and positive psychological capital, including self-efficacy beliefs but also collective efficacy beliefs, are important, **how can they be fostered?** In the context of human capital management (HCM), social capital management (SCM) and psychological capital management (PCM), Luthans & Youssef (2004) suggest several techniques, which seem appropriate for large companies with considerable human (and financial) resources. These techniques include selection guides for human resource managers, training and development programs for employees, and strategies to build tacit knowledge in the case of HCM. In the case of SCM, Luthans & Youssef (2004), recommend open communication channels, cross-functional work teams as well as work-life balance programs. Finally, for PCM, they suggest in particular the four sources of efficacy beliefs, described by Bandura (e.g. 1995), which will be elaborated before long.

However first, let me draw attention to the concept of **'serendipity'**. Serendipity's importance has been recognized in Economics and Business literature for HCM, SCM and for the entrepreneurial trajectory (Dew, 2009; Kingdon, 2012). It also seems to be what Luthans & Youssef (2004) recommend to cultivate through "open communication channels" and "cross functional teams". Besides, in the field of Psychology, Bandura (2001, 2006) posits that what he calls 'fortuity' has a considerable impact on human

agency. Essentially, both terms, serendipity[16] and fortuity, refer to the (same) idea of making valuable discoveries, by chance and by sagacity, of things one is originally not in search of (Merton & Barber, 2004). Note that fortuity/serendipity does not come about through mere coincidence. Rather chance needs to be met by agent's sagacity, for serendipity to fulfill its potential. This means that people are more likely to recognize fortuitous happenstances and make use of them, when they have developed their interests, capabilities and efficacy beliefs. It also means that people can cultivate serendipity to some extent by pursuing an active life and exploring new activities. (Bandura, 2001). Historically, serendipity has played a big role in major scientific innovations, such as the discovery of penicillin. However, its importance has also been demonstrated in the acquisition of human capabilities, in particular regarding the establishment of social networks (social capital/capabilities) and acquiring information and knowledge (intellectual capital/capabilities) (Bandura, 2006a; Merton & Barber, 2004).

While serendipity thus plays a role in enhancing social and intellectual capabilities, four sources of efficacy beliefs are particularly beneficial to people's psychological capabilities (Bandura, 1995; Luthans et al., 2004). According to Bandura (e.g. 1995), the first and most effective way to create and sustain perceived efficacy, is through **mastery experiences**: By engaging into an activity, trying it out and gaining hands-on experience, people can see for themselves how capable they are of that activity. Success contributes to robust efficacy beliefs, while failure undermines them, if they are not already robust enough at the time of failure. The second way of raising efficacy beliefs is by making **vicarious experiences** through social models, aka **observational learning**. In this method, instead of making mastery experiences themselves, people observe others making mastery experiences. When these other people succeed, this may lead observers to believe that they are capable of succeeding in the same activity as well. On the flip side, when the models fail, this may lead observers to believe that they would also fail at the same activity. Vicarious experiences are especially effective in creating a sense of efficacy, when observers perceive the social models as similar to themselves (Bandura, 1995). What is noteworthy about these two methods is that they not only contribute to raising (self- and collective) efficacy beliefs, they also entail and are mutually influenced by the accumulation of experience, skills and knowledge (intellectual capabilities) and the interaction with others (social capabilities). Social learning is an important element involved in these processes (Bandura, 1971).

[16] The term 'serendipity' was coined by the fourth Earl of Orford Horace Walpole in 1754, who used it in a letter to a friend, when speaking of the beneficial attributes of the princes he had read about in a Persian fairytale called *The three princes of Serendip* (Merton & Barber, 2004).

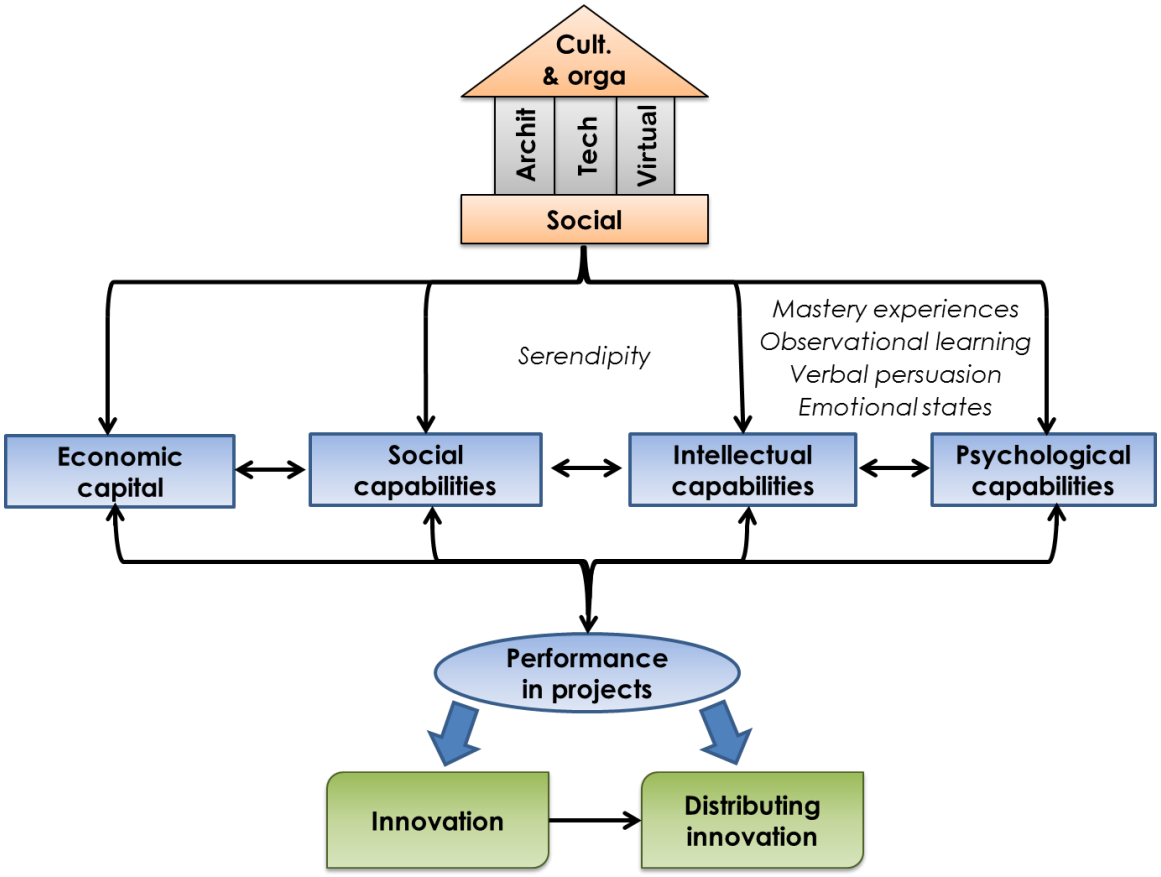
In comparison to the first two sources of self-efficacy, though effective, the last two are deemed somewhat less effective. **Verbal social persuasion** is the third source according to Bandura (1995): When people are told that they are capable of mastering certain activities, they are likely to try harder and longer, than if they doubt themselves and dwell on the potential consequences of their actions. When social persuasion indeed has the result that people are more perseverant, this promotes their development of skills and sense of personal efficacy. However, when, by contrast, people are persuaded by others that they lack the necessary capabilities for pursuing a certain action, this tends to lead them to give up more quickly or avoid these activities altogether. In fact, negative social persuasion tends to have a stronger negative impact on people's sense of efficacy than positive social persuasion has a positive impact (Bandura, 1995). **Physiological and emotional states** constitute the fourth source of efficacy beliefs. Bandura (1995, p.5) suggests that being in a good mood as well as "enhanc[ing] physical status, reduc[ing] stress and negative emotional proclivities, and correct[ing] misinterpretations of bodily states", such as stress, fatigue and pains, are beneficial to people's efficacy beliefs.

To sum it up, this section introduced some insights from the fields of Management and Psychology to the study of human development. It drew attention to the concepts of economic capital, social capital, intellectual capital and psychological capital, including individual and collective efficacy beliefs, and put that in relation with human capabilities as defined by Sen. In addition to that, it discussed the role of serendipity, alongside brief insights from SCM and HCM, in improving social and intellectual capabilities. Finally, it identified mastery experiences, observational learning, verbal persuasion and physiological and emotional states as sources of efficacy beliefs and thus positive psychological capabilities. It also pointed out that in the process of acquiring these psychological capabilities through the four sources of self-efficacy, social and human capabilities are often enhanced.

So what do these concepts and theories entail for studying the impact of innovation spaces on human development? This question is discussed in the next section.

5. Conceptual Framework

Fig. 2 Conceptual Model: the impact of innovation space usage on human development



(Author's illustration)

In a strongly simplified manner, the model (compare figure 2) used in this thesis conceptualizes how innovation spaces have an impact on users' capabilities as well as on their economic capital. Besides, it shows how these impacted capabilities and capital influence the performance of users, as related to their own projects. To underline the Senian understanding that they are of intrinsic importance to human development (in terms of the expansion of agency-freedom, agency-achievement, wellbeing-freedom, and well-being achievement), I address the immaterial – i.e. human, social and psychological – resources, as capabilities rather than as capital. As economic capital refers to the material assets traditionally referred to as such, I stick to the term economic capital in that case.

The top of the model shows the 'innovation space' "house", composed of the five highly-integrated space dimensions, as conceptualized in relation to Peschl & Fundneider's (2012), Prefontaine's (2012) and Gathege & Moraa's (2013) works. The blue

boxes in the middle refer to the capital and capability impacts that users experience as individuals, whereby the categorizations were made in relation to Luthans and colleagues' (Luthans et al., 2004; Luthans & Youssef, 2004) concepts. The blue ellipse below stands for the behavior/performance of the same individual users, in terms of pursuing their individual projects. As many, though not all, of these individual projects regard innovation and distributing/spreading innovation, these two concepts are depicted in form of green rounded rectangles at the bottom of the model. The black arrows show how the different elements are related to each other, and the words in italics, between several of the arrows pinpoint several mechanisms that come into play, in particular in the impact chains that they are depicted next to.

Using Sen's (1999) 'human development and capability approach' as an overarching framework, with my conceptual model, I argue that the usage of innovation spaces leaves a direct impact on the individuals who use them, by way of expanding their economic capital, but especially by improving their social, intellectual and psychological capabilities. I further posit that the way these innovation spaces have an impact on users' human agency has to do with the cultivation of 'serendipity'/'fortuity' as well as four 'sources of efficacy beliefs' devised by Bandura (e.g. 1995). I argue that innovation spaces expand users' capabilities by providing a setting, where (1) 'serendipity' and fortuitous encounters are cultivated, (2) where users feel enhanced in their 'emotional states', (3) where they feel 'socially persuaded' of their capabilities, (4) where 'observational learning' through social models is nurtured, and (5) where users are provided the resources to make 'mastery experiences' of their own. Besides, I suggest that the different types of impacts on capabilities are inter-related with each other. For instance, in line with Bandura (e.g. 1995), I argue that raised efficacy beliefs, which fall under psychological impacts, have a beneficial impact on learning, which falls under intellectual capabilities. Similarly, as knowledge is often transferred from one individual to another inside these spaces through peer-learning, I suggest that impacts on social capabilities are positively correlated to intellectual capabilities. In addition to that, as improved social capabilities frequently entail enlargements of users' professional network, which may lead to an increased number of job offers, I suggest that the impacts on social capabilities are positively correlated to economic capital, as e.g. more jobs typically result in more money.

On top of that, I hypothesize in accordance with Luthans et al. (2004) that, taken together, the impacts on users' economic capital and on their social, intellectual and psychological capabilities have an impact on users' performance in their individual projects. These projects may regard anything from a hobby over activist efforts or cultural activities to actual professional undertakings. Finally, I postulate, in line with Sen (1999) that by improving users' performance regarding their different projects, innovation spaces have an indirect impact on human development more broadly. After

all, many of these projects regard innovation activities, which have the potential to instigate social change and increase economic production. As this potential for local development can only be harnessed when the devised innovations are indeed distributed, spread and scaled, this factor is depicted in a separate box. It is hypothesized that the distribution of innovation may also be influenced indirectly by innovation spaces, through users' altered performance in their projects.

6. Research Methodology

Due to the dearth of research on the developmental impact of innovation spaces, I opted for an **exploratory research design**. The aims were to understand the perspectives of both innovation space users and innovation space founders/managers, in order to firstly confirm the basic assumption that innovation spaces indeed have an impact on human development, and secondly explore the ways in which this developmental impact is achieved. In this context, particular attention is given to an exploratory testing of two working hypotheses: (1) "Caireen innovation spaces contribute to users' agency freedom and achievement through the expansion of their capabilities", and (2) "Caireen innovation spaces have an impact on local development, through the innovation activities/projects their users engage in". **Data collection** in the form of literature review took place from December 2012 until September 2014. Fieldwork was conducted between 24 March 2013 and 25 June 2013 in Cairo, Egypt.

6.1 Case studies

Ten case studies of innovation spaces located in different neighborhoods of the metropolitan area of Cairo constitute the core of this fieldwork. They were selected based on snowball sampling, whereby I started with *icecairo*, an innovation space affiliated with my host organization. Based on Prefontaine's (2012) definition of innovation spaces and Audette-Chapdelaine's (2011) conceptualization of newly emerging spaces, I chose the criteria, presented in box 1, to select the case studies (compare Stercken, 2014a).

Box 1. Criteria for the case selection of innovation spaces

The innovation space…

- Has to include a physical environment
- Has to promote community
- Has to promote learning
- Has to promote making
- Has to provide the opportunity to engage with people, ideas and technologies
- Has to provide the opportunity to experience participatory culture
- Has to provide the literacies and skills needed to prosper in the 21st century

In line with the focus on newly emerging spaces, I added the following two criteria

- The space has to (self-) identify as or include a coworking space element OR
- The space has to identify as or include a hacker-/makerspace element

The amount of case studies that became part of this research project is influenced by the amount of newly emerging innovation spaces that exist in Cairo. While more such spaces potentially exist, these ten are the ones that are most well-known and talked about at the innovation spaces researched, while corresponding to the criteria outlined above (compare Stercken, 2014a).

6.2 Mixed-methods research design

In accordance with Johnson & Onwuegbuzie's (2004) pragmatic method, I opted for a mixed-methods research design, whereby qualitative methods enjoyed the dominant status but were complemented by quantitative methods. To give an overview, I used the methods in-depth interviewing of both innovation space founders/managers and users; I did participant observation, conducted an online survey, followed the innovation spaces' online presence, and gathered secondary information through literature review as well as through speeches and discussion panels that took place in the context of the conference *Re:publica 2014* in Berlin.

The choice for using these mixed methods was made for several reasons. Due to the dearth of research, it first seemed necessary to gain an understanding of the individual case studies, what they offer, why, how, with what intended impact and which contextual factors influence them. Owing to innovation space founders'/ managers' inside information on these topics, in-depth interviews with them seemed the logical first step. As in these interviews it became apparent that the main developmental impact was intended to be achieved on or through innovation space users, the next step was to corroborate these results and expand the understanding

through the inside perspectives of innovation space users themselves. These were obtained through in-depth interviews with users and through participant observation.

Based on the results of these qualitative methods, several working hypotheses could be made out, concerning different sets of users' capabilities that appeared impacted by innovation space usage. This is when Sen's capabilities approach was identified as an appropriate framework for analyzing the developmental impact of innovation spaces. With the help of the insights generated through the qualitative methods and through renewed consultation of secondary literature, it became possible to develop an online survey to test on a wider population of users whether and to what extent innovation spaces indeed expand those capabilities of users, identified through the qualitative results and deduced from secondary literature.

The in-depth interviews with innovation space managers and users were fully transcribed for the purpose of data analysis**.** The research software *NVivo* was used to support the analysis of qualitative data (i.e. in-depth interviews and memos from participant observation). The research software *SPSS* was used for the analysis of quantitative data, whereby the data could be exported directly from *SurveyMonkey* into *SPSS*, with the small intervention of aligning the Arabic data and the English data into one data set (compare Stercken, 2014a).

6.2.1 In-depth Interviews

This approach led to in total 13 in-depth interviews with 14 founders and/or managers of the innovation spaces, lasting between 27 min and 2 h 18 min[17]. In addition to that, 6 in-depth interviews were conducted with 7 users of these innovation spaces, lasting between 19 min and 1 h 14 min. While the sampling of founders/managers was purposive, the sampling of users was based on convenience, as I spoke with users who were present and spontaneously had time for an interview, when I visited the innovation spaces. Box 2 shows the criteria all interviewed users of innovation spaces complied with (compare Stercken, 2014a).

Box 2. Criteria for the selection of innovation space users as interviewees
The innovation space user… - Has to have physically visited the space multiple times in a period of at least two months - Has to have made use of the coworking area before AND/OR has to have made use of the hacker-/maker area - Has to have attended at least one event

[17] At some spaces, several managers were interviewed within the same or in separate interviews.

The language of interviewing was English, in which all of the interviewees were fluent, except for one interview with a German innovation space founder, that was conducted in German (compare Stercken, 2014a).

The questions were kept fairly open-ended and I used a low- to semi-structured interviewing style in order to allow interviewees to bring up topics and aspects that they found most important and relevant, from their own perspectives as insiders. It seems noteworthy that before collecting the data, I did not necessarily plan to collect data on the sub-topics that eventually came to be part of this study. Rather, they represent topics that came up again and again, when interviewing innovation space users and managers. At times, users brought up these topics immediately when I told them that I was doing research on the type of innovation space we were finding ourselves in[18], without me even asking any questions whatsoever. They would then immediately start telling me how much they liked the respective space or how much it had changed them. At others, these topics came up, when I asked users, whether they had the feeling that using the space had changed them in any way. Sometimes, users also brought up these topics, when I asked what they liked particularly about the space. Similarly, I asked managers whether they had the feeling that innovation space usage changed users in any way. In general, I never specified ways in which changes might occur but went with the topics users and managers brought up themselves. As a side remark, it can be said that the distinction between users and managers is often fluid, as many users volunteer regularly and take on management roles at these moments, while many managers also work on their own freelancing projects, aside from their management function at the respective innovation spaces[19].

6.2.2 Participant observation

Participant observation was conducted at multiple occasions, especially at three innovation spaces with different innovation space focuses, namely *Beit ElRaseef* (main category: event/meeting space), *The District* (main category: coworking space) and *icecairo* (main category: mixed, but with a tendency towards hacker-/makerspace). At times, I acted as a "participant as observer" by using the coworking area of the innovation spaces for my own work, e.g. to carry out literature research. At others, I acted as an "observer as participant" by attending events, such as weekly lunch meetings, workshops, hackathons or concerts. In these contexts, I blended in less than in the coworking situation, in particular because most events took place in Arabic and my

[18] Both in official interviews and at many more informal moments of participant observation
[19] For more information on the different organizational models made use of at the ten Caireen innovation spaces and the advantages and disadvantages these imply, please consult appendix 2.4.

knowledge of the language was fairly limited. Yet, in both instances of participant observation, I had the opportunity to experience first-hand some of the activities taking place at innovation spaces, observe social interactions and have more informal conversations, in a natural setting, than would have been possible through in-depth interviews only (compare Stercken, 2014a).

6.2.3 Online survey

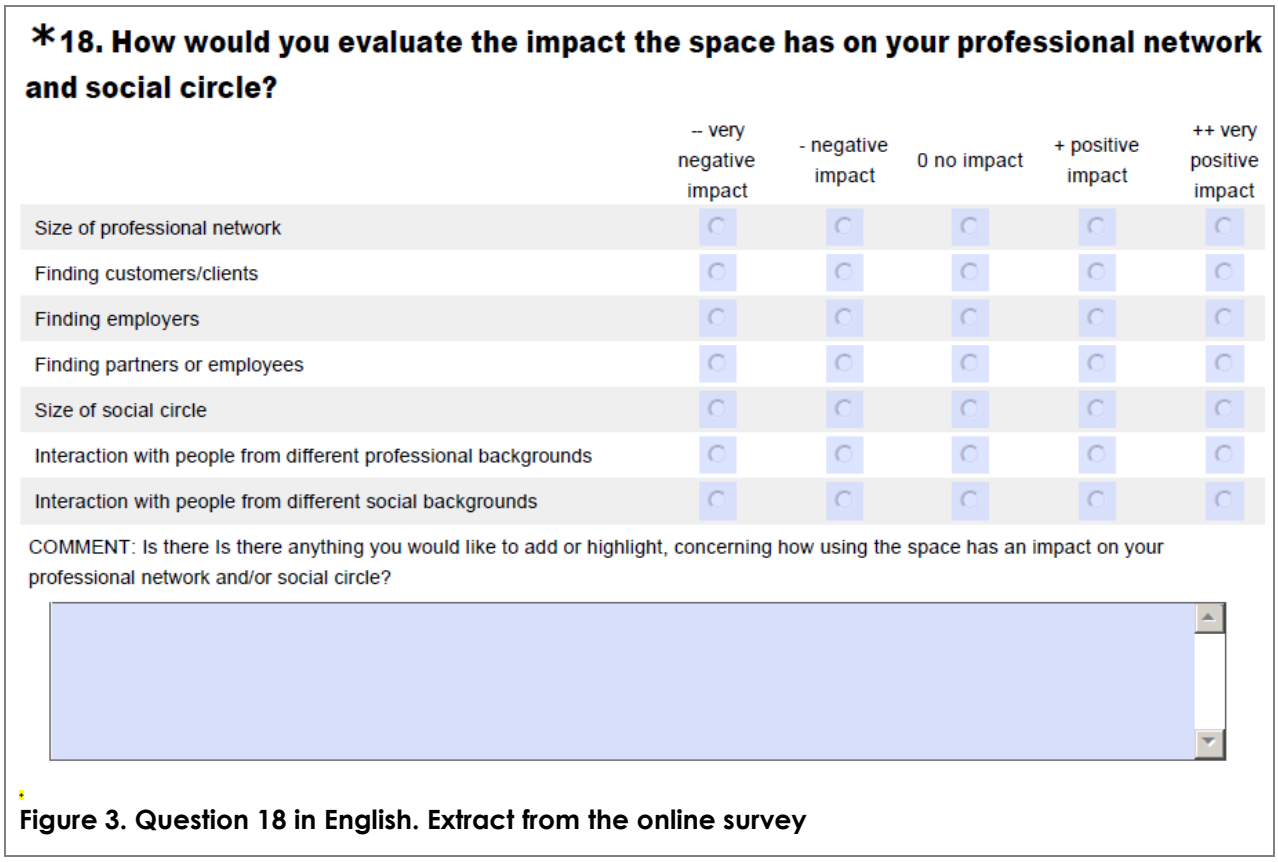
In total, the survey was comprised of 21 questions many of which had sub questions, and was divided into four sections. The first section dealt with demographic questions aimed at seeing whether the sample obtained seems representative of the population of innovation space users at large. Indeed, the indications participants made concerning their age, gender, nationality, degree of education and professional status largely corresponded to the estimates innovation space managers made about their communities of users. In that sense, the sample appears representative of the population under research. The second section of the survey included objective quantitative questions, regarding which innovation space participants make use of, which aspects of the space they use and how often. The third section asked participants in how far they agree on a scale of 5 (completely disagree, somewhat disagree, somewhat agree, completely agree, don't know) to statements about the practices and values in the space. Examples include statements such as "there is a strong sense of community between members" or "important decisions about the space are made by the managers alone" (compare Stercken, 2014). While most of the results obtained through these first three sections of the survey was already presented, analyzed and discussed in part 1 of this study, the findings of this master's thesis are at times put into relation with those of part 1. In that sense, it seems worthwhile to be aware of all research methods made use of.

Most questions concerning the impact of innovation spaces on users' capabilities were asked in the fourth section of the online survey, and were of **subjective quantitative** nature, although they were complemented by voluntary (qualitative) comment fields. According to Alkire (2005b), subjective quantitative studies, which (1) "reflect the internal experience of the respondent – including their own judgments and values about how well they are functioning in various dimensions"(Alkire, 2005b, p.222), (2) allow respondents to include both positive and negative experiences, and (3) "focus on enduring evaluations rather than fleeting emotional states" (Alkire, 2005b, p.222), are particularly appropriate for the study of human agency.

In the online survey, innovation spaces' impact was tested through 37 impact-related variables, with respect to four categories, namely the expansion of innovation space users' (1) social capabilities, (2) intellectual capabilities, and (3) psychological

capabilities, as well as several questions regarding (4) users' performance regarding the projects they work on. In accordance with Alkire's (2005b, 2005c) methodological suggestions, the questions were asked in a manner that appealed to the internal experiences of respondents; they referred to the overall lasting impact of innovation spaces – as isolated from potential confounding factors –; and were answerable through a five point scale, such that users could evaluate the impact as very negative, negative, neutral, positive or very positive. At the end of each question category, users were offered the possibility to leave a comment. For an example of category (1), please see figure 3 below. As the end of the online survey, respondents were provided the option to answer an open-ended question on the broader impact of innovation spaces on local development, "Do you think that spaces like this are or could become important for local development in Egypt (e.g. social, political, cultural, economic or environmental)? Why or why not?"

All questions were translated into Arabic by a professional translator, and cross-checked by a second professional translator, as well as by two managers of innovation spaces, to make sure that the Arabic version would indeed be understood in the innovation space context. Thus, respondents could decide whether they preferred taking the survey in English or Arabic. *SurveyMonkey* was used as a tool to create the survey online. The survey was distributed by various means: It was posted on the



***18. How would you evaluate the impact the space has on your professional network and social circle?**

	-- very negative impact	- negative impact	0 no impact	+ positive impact	++ very positive impact
Size of professional network	○	○	○	○	○
Finding customers/clients	○	○	○	○	○
Finding employers	○	○	○	○	○
Finding partners or employees	○	○	○	○	○
Size of social circle	○	○	○	○	○
Interaction with people from different professional backgrounds	○	○	○	○	○
Interaction with people from different social backgrounds	○	○	○	○	○

COMMENT: Is there Is there anything you would like to add or highlight, concerning how using the space has an impact on your professional network and/or social circle?

Figure 3. Question 18 in English. Extract from the online survey

Facebook pages of the respective innovation spaces, I hung awareness-raising information sheets about the survey on the blackboards at the physical innovation spaces themselves, the innovation space managers made aware of it through their online newsletters, and I personally asked users present at the innovation spaces, when I did participant observation, to complete the survey (compare Stercken, 2014).

Due to the length of the online survey, the drop-out rate was high. In general, the responses of participants were only analyzed if they at least indicated which of the ten innovation spaces, representing the case studies in this master's thesis, they made use of. 112 participants answered this question. Among these, 57 to 63 respondents answered the impact-related subjective quantitative sub-questions at the end of the survey[20].

To analyze the data obtained through the online survey, I mainly used univariate methods, in particular frequency distribution tables to determine variability and mode. Additionally, I performed bivariate analysis to determine correlations between different variables. The bivariate analysis was carried out by correlating all 37 impact variables with each other to gain an overview of which correlations exist and which do not. I then carried out contingency tables, whereby *p*, the probability to observe the test statistic if the null hypothesis holds, was determined through the Fisher's exact test. This test constitutes a good alternative to the Chi-Square test, when sample sizes are small[21]. I chose the commonly-used critical value of $p < .05$ to regard findings as significant and that of $p < .001$ to regard findings as highly significant (Field, 2009). To test the strength and direction of correlation between the impact-related variables, I determined *r*, Pearson's correlation coefficient[22]. To assess the effect size, I made use of Cohen's (1988, 1992, as referenced in Field, 2009) commonly-used guideline:

$r = .10$ → "small effect"[23]
$r = .30$ → "medium effect"[24]

[20] The differences in number of respondents result from respondents' accidental and/or in some cases perhaps purposive skipping of individual sub-questions as well as the respondent drop-out as the survey progresses.
[21] In most of the bivariate analyses conducted for this master's thesis, the Chi-square test was judged to generate too inaccurate results, as the prerequisite that all cells have expected frequencies greater than 5 often did not hold (Field, 2009).
[22] I opted for Pearson's *r*, because it allows for a more straightforward interpretation of the variance that is shared between two different variables than alternative rank correlation coefficients (Field, 2009). Yet, it seems noteworthy that there is a discussion concerning to what extent it is appropriate to apply statistical methods, like Pearson's *r*, that make use of the arithmetic mean, for Likert-type items as used in this survey (e.g. Boone & Boone, 2012). For the questionnaire applied in this study, Pearson's *r* was deemed appropriate.
[23] The corresponding $r^2 = .01$ implies that the effect accounts for 1% of total variance (Field, 2009).
[24] The corresponding $r^2 = .09$ implies that the effect accounts for 9% of total variance (Field, 2009).

r = .50 → "large effect"[25]

With *N*, the number of responses in the sample, on impact questions obtained in the survey between 57 and 63, according to Cohen (1992, as referenced in Field, 2009), we can expect to find medium to large effects. Consequently, for data exploration purposes, I only considered correlations greater than *r* = .40, but focused on correlations with an effect size greater than *r* = .50

6.2.4 Re:publica 2014

To compare the experiences of Caireen innovation spaces with similar ones in other countries of the so-called Global South, I repeatedly reference or quote speeches delivered at *Re:publica 2014*. Re*:publica* is a conference/festival which promotes itself as "Europe's leading conference on internet and society", and is held every year in Berlin, Germany. In 2014, *Re:publica* hosted 6,000 participants, and 500 speakers from 45 different countries. Most importantly, as the second year in a row, *Re:publica 2014* included the so-called *Global Innovation Gathering (GIG)*[26]. The *GIG* brings together innovation space managers, makers, hackers and start-ups from around the world, showcasing in particular best practices from Africa, Asia and Latin America. Among the participants of the *GIG* were the innovation space managers of two Caireen hubs, namely *icecairo* and *The District*, as well as a multitude of other stakeholders of innovation spaces with a main category in hacker-/makerspace or coworking spaces, but some also divergently 'technology incubators', from five different continents ("Re:publica 2014: Into the Wild - Die Konferenz. Das Ereignis," 2014).

6.3 Research setting and limitations

My role as a white, European, female **researcher**, previously unfamiliar with Egyptian culture and furthermore affiliated to the *large development cooperation organization*, is likely to have influenced the research setting and the way people responded to my questions. In particular my lack of knowledge of the language at times stood in my way of receiving a deeper insight through participant observation. For instance, during events, I would sometimes have to ask someone what was going on. This person would then switch to English for me, or some conversations may have taken place in English,

[25] The corresponding r^2 = .25 implies that the effect accounts for 25% of total variance (Field, 2009).

[26] The GIG is co-organized by *Re:publica*, *Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)*, *Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ)* and *AfriLabs*.

just because of my presence, which thus clearly altered the setting than it would have been otherwise. Yet, I felt that this way still kept the situation more natural than if I had brought along a translator for simultaneous translation (compare Stercken, 2014).

Another limitation is the relatively small number of **respondents** in the online survey. While those who took part according to the demographic results seem representative of the population, it is fairly probable that participants were more enthusiastic or engaged in their spaces than the average innovation space user. Also, it is possible that participants intentionally answered questions more positively, to make their spaces look good. Besides, it needs to be pointed out that some spaces, in particular the ones that I frequented most often, i.e. *Beit ElRaseef*, *The District* and *icecairo*, had many more participants in the online survey than some of the other spaces, though the maximum number of participants of the same innovation space was 13 (compare Stercken, 2014).

Furthermore, as has become apparent, although mixed methods are used in this research, qualitative as well as subjective quantitative methods dominate the overall data collection approach. This may have a bearing on the **generalizability** of the results. Besides, the subjective quantitative methods made use of in the online survey could entail limitations about the **comparability** of the scales and understanding of concepts (a) across individuals, (b) across societies, and (c) across multi-lingual samples (Alkire, 2005b). For instance, some individuals might evaluate meeting 5 new people at the innovation space as a very positive impact, others might only see it as positive impact and again others might value it as no impact at all in the greater scheme of things. Besides, individual respondents might have had varying understandings of concepts like 'community' or 'collaboration'.

Nevertheless, I would argue that this type of scaling allows to better capture the respondents' own judgments and values attached to these impacts, and is thus more in line with Sen's capability approach than had I instead used more "objective" scales, such as different amounts of people a respondent may or may not have met at an innovation space. Apart from that, the concepts, like 'community' or 'collaboration', which are used in the online survey, correspond to those used in everyday conversation at innovation spaces, by innovation space managers as well as users. What is indeed meant by these concepts in the innovation space context is therefore discussed, based on the interpretations offered by users and managers, in the analysis section. All in all, the broad research questions and focus on qualitative and subjective quantitative research methods were deemed beneficial for the purpose of this exploratory research.

7. Analysis

This analysis section is divided into two parts. Section 7.1 deals with the direct impacts of innovation spaces on their users. It is structured such that each sub-section discusses one category of capital or capabilities, as outlined in the conceptual framework. The first sub-section starts with innovation spaces' impact on users' access to and usage of economic capital. The second sub-section continues with the impacts on users' social capabilities. The third sub-section analyzes the impacts on users' intellectual capabilities. The forth sub-section scrutinizes the impacts on users' psychological capabilities. The fifth sub-section discusses the joint implications of the expansion of users' capabilities for their performance in the projects they respectively engage in.

Section 7.2 deals with the more indirect, broader impacts on local development, which arise through the projects, which users engage in. The first subsection discusses the nature of users' projects, points out the innovative character of many of these, and the potential that they hold for (local) human development more broadly. The second subsection puts this potential into context by discussing the different manners in which the different types of innovation are currently spread or could be spread in the future.

7.1 Direct impacts of innovation spaces: The expansion of users' capabilities

7.1.1 Impacts on users' economic capital

The impact of innovation spaces on the economic capital of users might seem the most evident of the different impacts under study. After all, users benefit from the shared workspace, meeting rooms and event space, and also from the corresponding furniture, office equipment, internet connection, high- and low-technologies etc., which are implied in the architectural and technological dimensions of the innovation spaces. This entails several advantages for users, working at these spaces.

From an economic capital point of view, independent knowledge workers, whether remote workers, freelancers or start-up entrepreneurs, who use the innovation spaces as coworking spaces, typically see the usage of the **shared workspace** as the better option to the most common alternatives of renting an own office, working at cafés or working from home. When asked why they work at innovation spaces, several users gave me the following responses.

> "Because we are a start-up, when [our company] start, we weren't have a large amount of money to rent a flat and all of the cost that go with it, equipment and the office

> supplies and blablabla. This is one of the main thing." (sic) ("Interview with user of the event/meeting space Mesaha," 2013)
>
> "The alternative for me was working in cafés and before knowing about The District, I was thinking about renting a place to work in. But actually, I'm a PhD student; so I don't get profit from what I doing. So it's too much of a cost. The District is still affordable. So I discovered that coming here is much better for the cost and it is also much better than working from a café, because cafés you don't feel at home. Sometimes you find it is very crowded. When the air conditioning is not adjusted, you just leave." (sic) (user B, in "Focus group interview with 2 users of the coworking space The District," 2013)
>
> "I know about coworking, because I have a friend who used to rent a small office before and pay lots of money. […] Because she just has a small consultancy, she said, 'I will work from home, because I don't have a lot of money and I don't have the jobs on a regular basis. Three or four months I have work to do. Other three or four months, I don't have any work to do'. So she […] started working from home. Until she realized, she is not doing the work like this. She is always struggling with the deadlines. […] So she started to hear about this coworking. And I could see the transformation" ("Interview with the entrepreneurship researcher Prof. Hala Hattab," 2013)

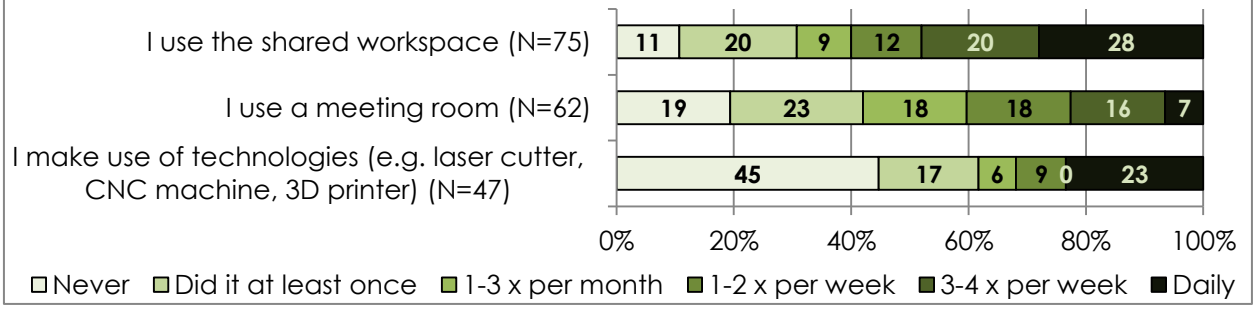
What these quotes illustrate is that, as shared workspaces, innovation spaces are viewed as the cheaper, more flexible and convenient alternative to renting a private office because it is easier to find an innovation space than an appropriate flat to rent, which would first have to be renovated, furnished, equipped, decorated etc. At innovation spaces, users only have to pay upon usage, if at all, whereas they would continuously have to pay for their own office. At the same time, the workspaces of innovation spaces are regarded as a better work environment, with less distractions and annoyances than both cafés and working from home. To put this into context, among the participants of the online survey with 75 valid responses to this question, 28% indicated to use the shared workspace on a daily basis, 32% use it regularly on a part-time basis[27], 9.3% use it occasionally each month, 20% did it at least once and 10,7% never use the coworking space element (compare figure 4).

Compared to that, the frequency with which people make use of **meeting rooms** at innovation spaces is (unsurprisingly) lower. With 62 valid responses, "only" 6,5% of survey participants specified daily usage; the relatively high amount of 33,8% use meeting rooms regularly on a weekly basis[28], further 17,7% use it 1-3 times per month, 22,6% did it at least once, and 19,4% never use a meeting room (compare figure 4).

So what value does the access to and usage of meeting rooms at innovation spaces have to people from an economic capital perspective? While to some extent, responses seem similar to those concerning the usage of shared workspace, there is nevertheless a different tinge to them. A freelance life-coach who frequently makes use of the meeting rooms at *Rasheed22* explains,

[27] 20% "3-4 times per week", and 12% "1-2 times per week"
[28] 16,1% "3-4 times per week", 17,7% "1-2 times per week"

Figure 4. Innovation Space Usage Patterns



> "I had a startup since 2007. Even before I joined Rasheed, I was working from home. The problem I had: I had a good idea, had a lot of Facebook activity – on the topic of part time job seeking activities. I had activities and everything, but I never really had a location to meet people. So when I came here, that was a huge step forward, […]because one things for me that I do on a regular basis is workshops" (sic) ("Interview with user of the coworking space Rasheed22," 2013)

What makes the usage of innovation spaces especially attractive to this user, is that he can conveniently make use of the same place he uses as a regular workspace (coworking area) to invite clients and conduct workshops. Rather than always being forced to find a place and rent it for specifically this purpose, he can simply rent one of the meeting rooms at his innovation space for a few hours. This user specified, "Market average for using rooms is 50 pounds per hour. Here it would allow you to have a room for half a day" ("Interview with user of the coworking space Rasheed22," 2013). In comparison to renting a meeting room elsewhere, renting one at innovation spaces generally allows users to save money, while providing a more professional work atmosphere than the other low-cost alternative of cafés.

Meeting rooms are not only of interest to freelancers and start-up entrepreneurs; especially at the strongly event/meeting space-focused innovation spaces *Mesaha*, *Almaqarr* and *Beit ElRaseef*, meeting rooms are used first and foremost by student organizations and civil society organizations (CSOs) – corresponding to the target group that is intended by the founders of these spaces (compare Stercken, 2014). Comparing this finding with those of other studies on the topic[29], this user group seems fairly specific to the context of Egypt. The reason for this seems to be that no appropriate alternative meeting spaces exist for university students and CSOs in Egypt. According to the interviewed users, Egyptian universities have reservations about many student organizations and often do not welcome the usage of university facilities as meeting areas. Two of the founders/managers of innovation spaces with an event/meeting space focus, who had previously been involved in youth-led initiatives themselves, told

[29] (e.g. "Betahaus - ein coworking Handbuch," n.d.; Gathege & Moraa, 2013a, 2013b; Moraa & Murage, 2012a, 2012b; Moraa, 2012, 2013; Olma, 2012; Spinuzzi, 2012)

me that they had experienced the following drawbacks of alternative meeting possibilities. Note that neither of them even refers to the possibility of working at universities.

> "Because we are all parts of NGOs and student activities before we started Almaqarr, […] we have meetings in different places, like Starbucks, Cilantro - we go into different cafés. Or something that is really popular in Heliopolis is that we go to centers. You know, where people go and get private classes. We rent these places and we go there. But these places are not so appropriate for meetings: maybe a lot of distractions, different kinds of people that do not suit what we do. So we were looking for a place that is suitable for our needs, that is not a hotel. Because it is really expensive to have a meeting in a hotel, especially when you are working for an NGO or student activity" (sic) ("Interview with Almaqarr cofounder," 2013)

> "But the main issue [when being part of youth-led groups] was the space. Where do we make our meetings, to make our preparations for our actions? We started to use cafés, which was costly for most of us, because at this time, I was still a student. And we started to rediscover public spaces like gardens from museums. But it wasn't safe. For example, if this meeting was in a museum or cafeteria or café, we find the waiter come closer to you, to listen what you are talking about. This was before the revolution. It wasn't safe. Everyone makes suspicion of you, or you are affiliated to political group" (sic) ("Interview with Mesaha cofounder," 2013)

Thus, using meeting rooms at innovation spaces is viewed as the cheaper option compared to costly hotels and cafés that require continuous consumption. As they are more private than cafes, "centers" and "public spaces like gardens from museums", innovation spaces' meeting rooms not only minimize distractions, they are also regarded as "safer", as those with differing opinions, who might be suspicious of them, could be excluded. And obviously, for highly fluctuating groups such as student organizations and volunteer-based CSOs, which operate in a completely not-for-profit manner, renting a private large office is typically not an option.

The last point about innovation spaces' value in terms of economic capital concerns the **technologies** that form part of the value proposition. In particular, hacker-/makerspaces offer access to equipment that the average hobby or independent professional user could typically not afford to buy on his/her own, and even if s/he could, the potential of these technologies would remain under-used. Examples of these technologies are the more expensive machines and those more typically found in factory-like conditions. In the case of hacker-/makerspaces, these are frequently geared towards personal fabrication (3D printers, CNC machines, laser cutters) but also more general electronic or mechanical toolkits.

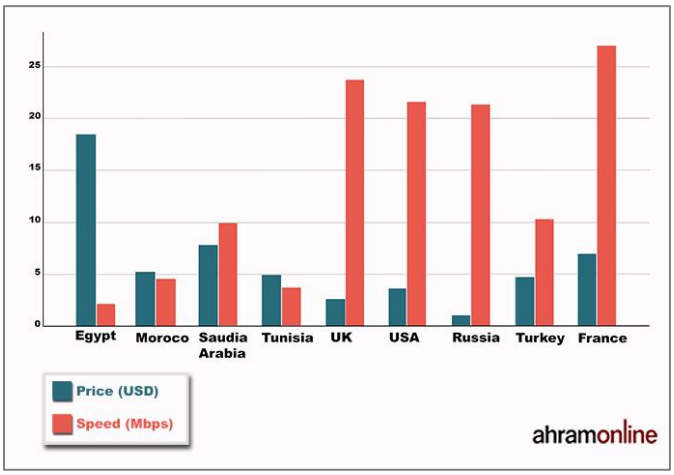
As with workspace and meeting rooms, the possibility to pay per usage and share technologies and acquisition costs is thus highly beneficial to the users of innovation spaces. One hackerspace cofounder/user pointed out that there is a similar issue about

technology usage as there is with meeting room usage: Universities and other institutions are typically unwilling to lend their equipment to students outside of class.

For this reason, he argued, innovation spaces are of such great importance, because they allow for a parallel system, where rules are established from the bottom up, so that sharing of technologies is not only allowed, but even encouraged. Though the innovation spaces with a main focus on coworking or events/meetings typically do not have very expensive and complex technologies, the shared usage of technologies such as printers, scanners, video projectors, landline telephones, white boards or coffee machines can be of benefit. Once again, to put these things into context, in the online survey, with 72 responses to this question, 23.4% of respondents indicated a daily usage of technologies, 14.9% use them multiple times per week, 6.4% use them 1-3 times per month, 22.6% did it at least once and 19.4% indicated that they never use the technologies provided at the space (compare figure 4).

Apart from these technologies, the access to **electricity and internet**, which can be considered as essential assets of innovation spaces around the world, may be of greater importance in Egypt than in more "advanced" countries. Compared to other countries of the so-called Global South, the access to electricity and internet may seem fairly high in Egypt. With 99.6% of the population covered, virtually everybody in Egypt appears to be served with electricity (The World Bank, 2014b). And although "only" 44.07% of the population are reported to use the internet[31] (International Telecommunication Union, 2013), I would dare to make the bold statement that the large majority of innovation space users, who mostly stem from the well-educated upper-middle class (Stercken, 2014), also have access to internet at home. However, the generally high access of innovation space users to the internet does not necessarily mean that their internet connection is good. In fact, one user pointed out,

Figure 5 Egyptian internet price and speed in international comparison[30]



> "Finding a place with good internet access is a problem in Egypt. You could have good speed, but the connection will not hold. Or you have a stable connection but you can't

[30] Source: http://english.ahram.org.eg/NewsContent/1/151/95648/Egypt/Features/Campaign-to-improve-internet-speeds-in-Egypt.aspx

[31] As a comparison, in the Netherlands, 93% of individuals use internet, while e.g. in Ethiopia only 1.48% use internet (International Telecommunication Union, 2013).

> get good speed. […] So when I came here, it was a huge step forward" ("Interview with user of the coworking space Rasheed22," 2013)

Many innovation space users and also founders/managers voiced similar concerns, and additionally complained about the prohibitively high prices for internet in Egypt. According to a news article published in *Ahram Online*, the average internet speed in Egypt is 2.22 megabytes per second (Mbps) at a cost of (what would be converted to) 18 US dollar. This means that on average, Egyptians pay almost five times as much for a connection that is not even one tenth as fast as the average in the United States of America (compare figure 5) (Barsoum, 2014). And these averages even disregard the fact that among fixed-broadband subscriptions, less than 10% actually reach 2 Mbps, with none at all going over 10 Mbps[32] (International Telecommunication Union, 2013). Besides, these statistics do not take into account the internet cuts and electricity cuts, which result in a loss of the internet connection as well, and are fairly common, especially in Egyptian summers (Stercken, 2014).

While these exorbitant prices for relatively poor internet connections also constitute a problem at/for innovation spaces – one founder/manager actually told me the monthly internet bill they paid was almost as high as the monthly rent for the physical space –, innovation space users generally benefit from the fact that, as a larger group of users, they can invest in/make use of a better internet connection than they could get just for themselves at home. Several Caireen innovation spaces even try to combat the problem of internet outages by having subscriptions with two different internet providers. On top of that, one of the (higher-end) coworking spaces actually offers a personal electricity generator that can maintain the internet connection when the electricity is cut (Stercken, 2014). It is in this context of providing better access to internet and power, that Temitayo Akinyemi (as voiced in Akinyemi, Fajardo, Gutierrez, & Knight, 2014), the manager of the pan-African innovation space network *AfriLabs*, suggests that innovation spaces could "serve as **gap-builders** [emphasis added] for offering the infrastructure", which otherwise often lacks on the African continent.

To sum up this section, innovation spaces have an impact on their users' economic capital, by providing them with workspace, meeting rooms and technologies – all of which they receive at innovation spaces for better-value-for-money than elsewhere. In some cases, innovation spaces even provide users with access to technologies, which they could otherwise probably not access. And to some extent, innovation spaces can be viewed as gap-builders by offering this infrastructure. All in all, I feel that the comment of one of the respondents to the online survey provides a good summary of this value of innovation spaces, while nicely introducing the next

[32] To compare, in the Netherlands, about 60% of fixed-broadband subscriptions have a speed higher than or equal to 10 Mbps and almost all of the remaining subscriptions lie between 2 and 10 Mbps (International Telecommunication Union, 2013).

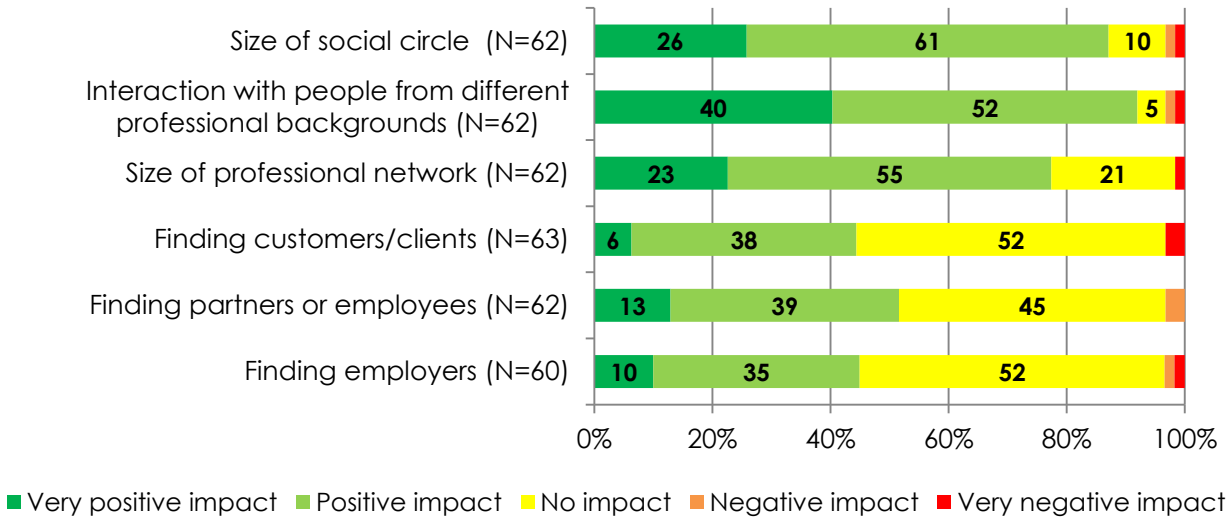
sections, "I think they're very important, they help startups, freelancers and hoppyists with low budgets to get on their feet with much less money spent. It also enriches the members sociailly, culturaly and professionally." (sic) (Written comment by an online survey participant who is a user of the event/meeting space Beit ElRaseef).

After all, if it were only for the economic capital they provide, innovation spaces would not be much different from office rental facilities. Although economic benefits typically seem to be the benefits that attract users to the innovation spaces in Cairo at first, most users later come to see other benefits as more valuable.

7.1.2 Impact on users' social capabilities

Together with impacts clustered under the header "impacts on users' psychological capabilities", the topic of "impacts on users' social capabilities" was brought up by interviewees most frequently and talked about with most intensity. Before discussing what these impacts mean to users and how they come about, let me give an overview of the types of impacts on social capabilities that were reported. Frequency distribution tables of the responses given in the online survey to multiple variables regarding the overarching question, "How would you evaluate the impact the space has on your professional network and social circle?" indicate the following:

Figure 6. Frequency distributions regarding the question, "How would you evaluate the impact the space has on your professional network and social circle?"



A total of 87.1% of respondents reported a positive impact on the *size of their social circle* (of which 25.8% even indicated a very positive impact). Since the professional backgrounds of users are fairly mixed, as demonstrated in Stercken (2014), it does not

come as a surprise that, related to the fact that as the size of users' social circle increases, their *interaction with people from different professional backgrounds* also rises: A total of 91.9% of respondents indicated a positive impact (of which 40.3% even reported a very positive) as a result of innovation space usage. For many, though not all respondents, the heightened interaction with other people (amongst others from different professional backgrounds) also results in increases of the *size of their professional network*: 77.4% of respondents saw positive impacts on their professional network. Concretely, 44.4% of respondents indicated positive impacts on *finding customers/clients*; 51.6% of users specified positive impacts on *finding partners or employees*, and 45% indicated positive impacts on *finding employers.* However, in all of the last three frequency distributions the mode lay at no impact (compare figure 6).

So what do these impacts mean to users? With regards to the growth in users' *size of social circle,* some users told me that they simply appreciate being around other people, in whose environment they enjoy working on their individual projects. For others, the impact goes beyond that. They make use of innovation spaces as places to get to know new people, build friendships, or make business contacts. One user of the event/meeting space *Beit ElRaseef* told me,

> "From the first time I came here, I became addicted. It made me break some hard obstacles in me. […] I came here alone, but then I got to know all of them and became one of them. I think it's the perfect place for socializing." (participant observation at the event/meeting space Beit ElRaseef)

Like several others, this user explained that he had felt lonely before joining the innovation space because after graduating from high school and university it was difficult for him to get to know new people. This impression was shared, in particular, by people who were self-employed or work in start-ups, and thus do not have as frequent contact with many colleagues as they would if they worked for a large business or organization. Innovation spaces are thus important to these users, because they allow them to overcome their loneliness, establish friendships and feel part of a community[33], as illustrated in the quote above.

With respect to impacts on users' *professional network*, it should first be noted that these impacts are of relevance to many but not all users. Indeed, in the voluntary comment field, some survey participants indicated that they do not intend to establish professional contacts because they only use the innovation space for hobby purposes or because the type of work they do does not require further professional contacts. Nevertheless, for a large amount of users, the professional contacts made at innovation

[33] This corresponds to the finding already presented in part 1 of this study: 56% of respondents "completely agree" and 32% "somewhat agree" that "there is a strong sense of community between members" (while 6% indicate that they "don't know").

spaces were of great importance. One social entrepreneur, who started a foundation that seeks to address the problem of marginalization of Nubians in Egypt by spreading Nubian art and culture, told me,

> "The networking is the core. It's the main thing of everything. It's the networking that gets you the advice. It's the networking that gets you the marketing channels. They get you whoever will work to make your products. They will get you whoever to make your products better." (User A in "Focus group interview with 2 users of the coworking space The District," 2013)

Indeed, this user specified that in the process of starting up and growing her foundation, she had worked together with a considerable number of coworkers that she got to know at *The District*, including, amongst others, a Nubian product designer and a web designer, somebody with expertise in rooftop farming, and a PhD student who deals with Nubian architecture. In this context, it becomes clear that the diversity of professional backgrounds present at innovation spaces leads to considerable opportunities for collaboration and outsourcing. Similarly, in various informal conversations, different users told me that they had met people at these spaces who later became their business partners for a venture for which they decided to be co-founders. Also in a non-professional more hobbyist context, I met users who told me that they had met the people at the event/meeting space *Beit ElRaseef* who later became part of their musical band. Also, I got to know users at hacker-/makerspaces who were happy to have gotten in touch with fellow technology enthusiasts, together with whom they could now work on projects like building robots, self-fabricating 3D printers etc. Taken together, these insights provide an explanation to the positive impacts of innovation space usage on users' opportunities of *finding customers/clients*, *finding partners or employees*, and *finding employers.*

Still, the question remains: How do these impacts on social capabilities come about? While the physical dimensions of innovation spaces (architectural space, technological space, and virtual space) play their role by providing a platform on which users can interact and tools they can use to interact or while interacting, they do not explain it all. The social dimension as well as the cultural and organizational space dimension of innovation spaces is of great importance in this regard. After all, networking impacts are not inherent in the physical space; an empty space cannot improve social capabilities. Rather, it requires a sizeable community of users for such impacts to even be possible. In addition to that, the users need to be open and willing to interact and engage into networking.

In fact, these pre-requisites are all but self-evident, especially when innovation spaces are newly founded. Multiple founders/managers of Caireen innovation spaces told me that, especially at the beginning, they experienced considerable challenges in

attracting a community of users and in getting these users into a state of mind where they would interact with each other[34]. One of the founders/managers of *The District* explained,

> "so many people are meeting and saying, 'yeah, but if I come here and start sharing, they might steal my idea' – and this type of thing – 'If I am sharing, what are you offering to me?' But it's not like this. From what is the concept, we are not offering you something, but it's the community that is offering you something. It's the whole concept of gift-economy that we are being open and transparent and collaborate with others. Just like practicing serendipity – you don't know what's happening. But we have some coworkers and after two or three, six months, one year, they are starting to work together more, work with other coworkers, exchanging ideas, making business deals, whatever" (Cofounder of The District, in "Focus group interview with 1 founder and 1 manager/user of The District," 2013)

As evident from this quote, it took and still takes a great deal of promotion of the innovation space values (community, collaboration, openness, accessibility – and to a lesser extent sustainability and a hands-on imperative) from the side of founders/managers, as well as a great deal of practicing from the side of users and also founders/managers, for the networking potential of innovation spaces to be fully unleashed. Fortunately, as the innovation space communities are growing, the same founder/manager explained, it is getting easier and easier to convince people of these values,

> "That is something I learned myself: the community behavior change is very much easier than individual behavior change. When you are part of a community and you see everyone open, it's like, 'hey, maybe it's not as bad as expected'. So many of our coworkers were like when they were joining at the beginning they thought, 'okay, it's nice place and it's close to my house. It's just a physical space'. But then, when they started coworking, they realized that there is different value added that they didn't expect. So it's really about experiencing it." (Cofounder of The District, in "Focus group interview with 1 founder and 1 manager/user of The District," 2013)

So through the promotion of these innovation space values, the founders/managers and increasingly also the users themselves are essentially trying to cultivate the practice of 'serendipity'[35], as introduced in section 4.3: They seek to increase users' sagacity/cleverness concerning both their predisposition to making valuable,

[34] For more information on the challenges in attracting and growing innovation spaces in Egypt, please read appendix 2.1.

[35] Interestingly, several founders/managers as well as users, at the innovation spaces *The District* and *Qafeer Labs*, explicitly used this term in interview or participant observation contexts, as apparent in the quote at the top of this page. Their awareness of this concept appears to be grounded in the fact that the founders of these spaces had read the Dutch practitioner Olma's (2012) coworking guide "The Serendipity Machine – A Disruptive Model for Society 3.0" ("Focus group interview with 2 users of the coworking space The District," 2013, "Interview with Qafeer cofounder," 2013)

unexpected encounters and discoveries happen, and seizing the opportunities that arise from these encounters and discoveries. By growing the respective communities, they also increase the chances for serendipitous encounters as more people result in more contacts, more knowledge, more commonalities, more differences and more possibilities to complement each other and collaborate. This applies to impacts on social capabilities as much as to impacts on intellectual capabilities, whereby the latter will be re-discussed in the subsequent sub-section.

I could list numerous quotes of users speaking of the serendipitous encounters they made while at the innovation spaces. In addition, I witnessed quite a few serendipitous encounters first hand, while conducting participant observation at these spaces. To give an example, I had the chance to attend the regular Monday community lunch at *The District*, where a new user introduced herself and the fact that she works for an association that seeks to connect Arabic documentary film-makers and producers with each other. A few minutes later, she had already exchanged contact details with two of the other eleven users present at the community lunch, after one of these others pointed out that his wife also made documentary films and the other threw in that his best friend is a documentary film producer. Similarly, during a focus group interview at that same innovation space, my question, whether they saw how the innovation space also had impacts on other users, enticed the following dialogue between users A and B.

> "User A: For example [user D]: he is working on IT and Web Design. And he's doing the designing and the corporate profiles and these things for most of us here in the District. So he got very good business by being here.
> User B [excited]: I didn't know there was a web designer! I also need a web designer! Who is he?
> User A: It's [gives name of user D]. I can give you his number…" (sic)
> (Users A and B, in "Focus group interview with 2 users of the coworking space The District," 2013)

So, introductions can be made through third persons, including other users or the managers of the innovation spaces, as demonstrated through the previous quote. But quite often (serendipitous) encounters come about through random encounters, while users cowork or more frequently while they take a break from work or from a meeting, e.g. in the kitchen or lounge area. In this context, one user noted,

> "I think the most important place for networking is the kitchen! All the important meetings, the important business, the networking is done in the kitchen. I didn't get the rooftop farming people… We were having pizza night here and we were making pizza and we started to introduce each other to each other. And we started to talk. I do lalala, you do lalala… Ah! Can we work together? And they made some research what are the types of plants we can use there. And then one day I met [user C]. What do you do? Ah, he's a product designer. Do you know Aswan? Yeah, his wife is from Aswan. Can you do some

> designs for us? He came for us then and he lived for a while with the people and now we're having a product designer here. And we've talked the first time in the kitchen as well." (User A, in "Focus group interview with 2 users of the coworking space The District," 2013)

And finally, numerous instances for networking also arise during events held at innovation spaces, whereby many of these are particularly organized to make users more familiar with each other, to increase their interaction and thus to make collaboration more likely. Examples of such events include community breakfasts, lunches, or evening hang-outs, often involving the element that new users introduce their projects or initiatives in these contexts. Other examples are meditation and aerobic sessions, movie nights and concerts.

One user of the events/meeting space *Mesaha*, who is part of a start-up that provides an open innovation and crowdfunding platform for artisans, even pointed out that the serendipitous encounters at the innovation space had become so essential to her organization, that they wished to stay at *Mesaha*, despite the fact that the start-up was outgrowing the limited coworking capacities of that particular innovation space: With the considerable amount of innovators, NGOs, student activists and SMEs, who come to use *Mesaha* for meetings, attend discussions etc., her start-up has good chances to run into artisans or receive contact with artisans willing to become part of the platform.

In line with the necessity of sagacity for bringing about serendipity, one of the innovation space founders shared his impression that those users who take serendipity most seriously, by helping others, be it with their contacts, skills or information, typically also receive the greatest benefits at later points in time. Besides, particularly sagacious serendipity-cultivators seem to search for places in which they expect to find the kind of people they wish to meet, be it at their own "base" innovation space or at other places in the city or throughout the country. Once again, as an insight from the woman who founded the organization against the marginalization of Nubians,

> "Because I'm more working on social things… Whenever I need the social connection, networks, people, volunteers, people who want to help – I go to some places which are more related or engage more into NGOs and social causes. Whenever I need technical or business support or something related to entrepreneurship, I go to the other places. Or usually I come here to the District. You can find entrepreneurs who help with causes here sometimes." (User A, in "Focus group interview with 2 users of the coworking space The District," 2013)

As examples for places she uses that engage with NGOs, this user named the coworking space *Rasheed22* and the events/meeting space *Mesaha*. For receiving business support, she said she mainly goes to *The District*, visits her former colleagues from the times when she still worked as a banker at the technology and business park *Smart*

Village or goes to one of the Egyptian venture capital firms (compare also Stercken, 2013).

To conclude, since the social space dimension is regarded as the basis of innovation spaces, one would expect impacts on users' social capabilities to result from innovation spaces usage. Indeed, both qualitative and quantitative research revealed that the large majority of innovation space users speak of positive impacts on both their social circle and professional network. The way in which such impacts come about seems to a great extent related to the practice of serendipity. Therefore, innovation space founders/managers and increasingly often the users seek to cultivate serendipity, through the promotion and practice of the values entailed in the cultural and organizational space dimension of innovation spaces.

7.1.3 Impact on users' intellectual capabilities

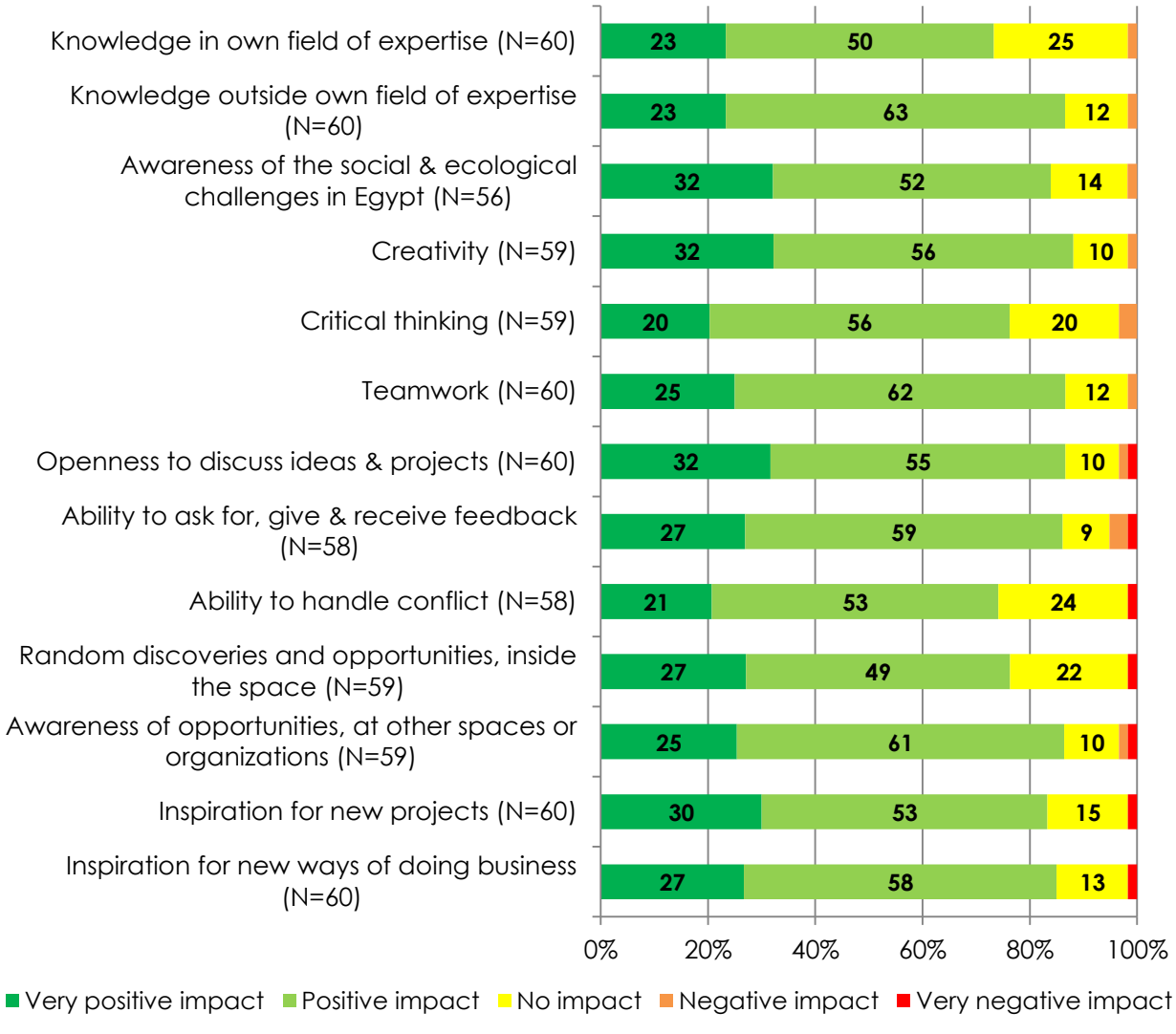
Apart from impacts on users' economic capital and social capabilities, one would expect impacts on users' intellectual capabilities to arise from innovation space usage. After all, these are even implied in Prefontaine's (2012) definition of innovation spaces as "physical environments that promote community, learning and making". In this section, I again start with an overview of the types of intellectual capabilities that are impacted by innovation spaces, and then provide an explanation regarding how these impacts presumably come about.

For an overview of the frequency and level of impacts, as determined through the online survey, please look at figure 7. Impacts on knowledge were researched through the variables *knowledge in own field of expertise*, *knowledge outside of own field of expertise*, and *awareness of the social and ecological challenges in Egypt*. The researched skills include *creativity, critical thinking, openness to discuss ideas & projects*, *ability to ask for, give & receive feedback*, and *ability to handle conflict*. In terms of impacts on information/ideas, I looked at the variables *random discoveries and opportunities inside the space*, *awareness of opportunities at other spaces or organizations*, *inspiration for new projects*, and *inspiration for new ways of doing business*.

What becomes apparent through these frequency distributions is that the large majority of users perceive the impacts on their intellectual capabilities as positive. On all studied variables, the mode was positive impact, and, with the exception of two out of twelve variables, the second most frequent response was very positive impact. Taken together, a minimum of 73% of survey respondents saw a positive or very positive impact on all variables related to intellectual capabilities. The intellectual capability that the largest proportion of people saw positively impacted was *creativity* (88.1%). However, this skill was closely followed by the variables *knowledge outside of own field of*

expertise, *awareness of opportunities at other spaces and organizations*, *inspiration for new ways of doing business*, and multiple others. The percentage of people who indicated a very positive impact was over 30% for the variables *creativity*, *awareness of social & ecological challenges in Egypt*, *openness to discuss ideas and projects*, and *inspiration for new projects*. The comparatively highest proportions of people who saw no impact (or even negative impacts) existed for the variables *knowledge in own field of expertise*, *ability to handle conflict*, *critical thinking* and *random discoveries inside the space*.

Figure 7. Frequency distributions regarding the question, "How would you evaluate the impact the space has on your knowledge, skills and/or information?"



So how do these impacts on intellectual capabilities come about? Three concepts introduced in section 4.3 are of importance in this context, namely serendipity, as well as Bandura's (1971, 1995) 'mastery experiences' and 'observational learning' a.k.a. 'social modeling' or 'peer learning'.

Two variables tested in the online survey refer to the occurrence of serendipity in the context of intellectual capabilities, namely the variable *random discoveries and opportunities inside the space*, and to some extent also the variable *awareness of opportunities at other spaces or organizations.* In this respect, users told me that a lot of the information and knowledge they gained at innovation spaces came about unexpectedly, without them searching for these insights, but seemingly by random chance through interacting with other users – just as social and professional contacts are made serendipitously. In this sense, it is not surprising that both variables are strongly correlated to the impacts on users' *size of professional network* and their *interaction with people from different professional backgrounds*. Besides, it appears logical that serendipitous discoveries may result in *inspiration for new projects,* in *inspiration for new ways of doing business* and in increased levels of *creativity.* Apart from that, one might assume that such serendipitous discoveries are dependent on users' predisposition towards knowledge-sharing and collaboration. The very strong and highly significant correlations with the variables *openness to discuss ideas and projects* and *ability to ask for, give and receive feedback* support these assumptions (compare box 3).

Box 3. Which impacts on human capabilities are most strongly correlated to the impact on users' serendipity?

Correlating all 37 impact variables with each other revealed that the following seven variables are most strongly (not only r > .5, but at times even r > .6, r > .7 and r > .8) and highly significantly (p < .001) correlated to the two variables relating to users' achievement of serendipitous discoveries: *random discoveries and opportunities* inside the space and *awareness of opportunities at other spaces or organizations.*

Impact on:	Social Capabilities		Intellectual Capabilities				
Pearson Correlation	Size Prof. Network	Interaction Ppl. Diff. Prof. Backgrounds	Creativity	Openness Discuss Projects	Give Ask Feedback	Inspiration New Projects	Inspiration New Ways Do Business
Random Discoveries Opps Inside	,592**	,650**	,713**	,640**	,668**	,621**	,806**
Awareness Opps Elsewhere	,600**	,684**	,669**	,694**	,729**	,703**	,732**

**. Correlation is significant at the 0.01 level (2-tailed).

Yet, the way in which intellectual capabilities are gained does not result from serendipity only. More often, users actively seek particular knowledge, skills and information,

whether by searching for the relevant insights on their own, e.g. through the internet, or by learning from their peers at innovation spaces. As users are continuously encouraged to share their knowledge, skills and ideas in the sense of the innovation space values/principles, much mutual support and information-sharing takes place in normal coworking space, meeting room, or free time usage situations. In this context, consider the following quotes.

> "One of the engineers is doing a masters, so we have sometimes exchanged ideas and resources about how to write theses and he's also an engineer, so he knows a lot of softwares I'm working with. So we have discussions and talks about the best way to write theses, how to get resources etc." (User B, in "Focus group interview with 2 users of the coworking space The District," 2013)

> "So I'm trying to be more active in this spaces/incubator thing, well one, because I am just seeking information… about new trends, developments and what's happening in this country… These are breeding points for meet-ups, spaces, seminars and stuff. It's a good place to learn about what's happening and gaining up-to-date info." ("Interview with a user of different coworking spaces," 2013)

Thus, everyday interactions at the physical space can lead to knowledge-/skills- or idea-transfer. Interactions that increase intellectual capabilities also take place via the virtual component of innovation spaces. For instance, via the *Facebook* groups related to the different innovation spaces, users often post questions to the entire community, asking things of the type, "Can anybody tell me where I can buy material X?", "Who knows somebody with expertise in field Y and can connect me?", or "I tried to build a do-it-yourself Z, but I keep on bumping into problem W. Who knows where I'm going wrong?"

In addition to these informal instances of peer learning, many innovation spaces provide users with explicit opportunities to acquire skills and knowledge by offering trainings and workshops. Through these, users can make mastery experiences of their own and learn from others in a protected and structured environment. For a better understanding of the ways and types of knowledge and skills that are transferred through trainings and workshops, it is worth distinguishing between three types of events held at innovation spaces:

- Trainings, workshops and events given by the innovation space staff, whether employees or volunteer managers
- Trainings, workshops and events given by partner organizations of the innovation spaces
- Trainings, workshops and events given by individual innovation space users

Depending on who is the organizer, the innovation space staff has varying influences over the content and type of trainings and workshops, which sometimes results in a

motley combination of events organized at the same innovation space. Whereby individual innovation space users (are free to) hold trainings, workshops and events at all innovation spaces, the innovation space staff only organizes their own events at some spaces; and only some spaces have partner organizations. Furthermore, the duration of the trainings and workshops range from one-off events of one or two hours to multiple-day seminars or weekly recurring events. Some are for free; others require considerable participation fees, though many innovation spaces make special offers or even grant free participation for users who would otherwise not be able to participate in these events[36].

In terms of the content of trainings, workshops and events, the most common recurring staff-organized events at both coworking and event/meeting spaces are social gatherings that are intended to increase networking and community-building among users, as elaborated in the previous section on social capabilities. The most common recurring staff-organized events at hacker-/makerspaces are trainings or workshops that teach users how to use the hacker-/makerspace machinery (3D printers, laser cutters, CNC milling machine etc.). Besides, they offer workshops teaching the basics of electronics, micro-programming and -control, and design workshops for 2D and 3D modeling. Among those innovation spaces which claim to have a "sustainability" focus, *icecairo* and *Qafeer Labs* stand out as spaces, which also organize discussion rounds and sometimes ensuing hackathons on the topic of persisting sustainability challenges in Cairo and Egypt (pollution, waste, energy etc.), and finding, inventing or building as a community ways to tackle these challenges. An example in this context would be the solar-water-heater-hackathon organized at *icecairo*, as described in Stercken (2014). Discussions on the social dimension of sustainability (regarding topics like poverty, sexual harassment, educational inequalities etc.) are more common at *Rasheed22, Mesaha* and *Almaqarr*. However, these are typically not organized by the innovation space staff, but by the activist groups that make use these spaces.

The types of trainings or workshops that are provided by partner organizations vary as well and are obviously dependent on the partner organizations the innovation spaces have. Many innovation spaces, which seek to promote entrepreneurship, team up with different local and global entrepreneurship-support-organizations, who offer trainings on topics such as marketing, finance or presentation skills at their innovation spaces. To provide some other examples, at the development agency-backed innovation space *icecairo*, the development cooperation organization organizes numerous trainings that are meant to increase participants' expertise of ecological sustainability and increase their employability. Such events include public lectures and workshops on lifecycle assessment, inclusive agribusiness or industrial ecology.

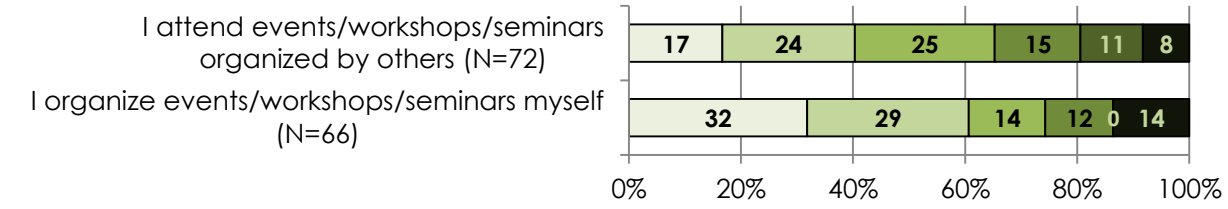
[36] For more information on this topic, please consult Stercken (2014).

Finally, individual innovation space users are free to organize, with a few restrictions, pretty much any type of workshop, training or event they wish at innovation spaces. Depending on the backgrounds of users, this leads to trainings on various topics. Some users choose to teach programming languages – a common type of training at all types of innovation spaces. Other users invite to discussion rounds, to find fellow enthusiasts and gain feedback on topics of interest to them. For instance, after a workshop at *icecairo* on the topic of biogas, one user was particularly enthusiastic and decided to start a *Facebook* group with the other participants that were interested. Several of them stayed in touch afterwards, organized further meetings, with additional people, received funding from the *large development cooperation organization*, built a prototype together and continue to work together as a start-up team. Another example is a series of graphic facilitation workshops that was organized by an Egyptian female teenage user, first at icecairo, and after highly positive feedback from the participants, later also at other Caireen innovation spaces. At the culture-focused innovation space *Beit ElRaseef*, numerous users share their skills through things like free guitar or flute lessons, edutainment programs for children, photography or pantomime workshops. At different innovation spaces, users also organize handicraft workshops, concerning e.g. making furniture or jewelry.

What should generally become apparent from the multitude of hands-on workshops and trainings offered at innovation spaces, is that they generate lots of opportunities for users to make, what Bandura (e.g. 1995) refers to as, 'mastery experiences'. And these 'mastery experiences' are typically paired with 'social modeling': By learning new skills and knowledge and immediately applying them in a workshop situation, users can experience success (or failure) and learn from the trainers as well as from their peers, thus leading to peer-learning and mutual encouragement.

Due to this large diversity of workshops and trainings, it unfortunately seems impossible to track the impact of individual events on its users. To at least get an impression of the usage patterns, please consider figure 8, which summarizes the results from the online survey. It reveals that the large majority of respondents (83%) attended an event, workshop or seminar at their innovation space at least once before, that about 60% do so rather regularly, with 34% even doing so once or multiple times per week. In comparison to that, the frequency with which users indicated to *organize events/workshops/seminars* themselves was unsurprisingly lower. Nevertheless, as many as 68% of respondents indicated to have organized an event at the innovation space themselves, and 39% even appear to do it on a more frequent basis.

Figure 8. Innovation Space Usage Patterns



The relevance of innovation spaces in increasing users' intellectual capabilities is underlined in the following comment, made in a similar manner by multiple respondents in the online survey, when confronted with the open question, "Do you think that spaces like this are or could become important for local development in Egypt (e.g. social, political, cultural, economic or environmental)? Why or why not?"

> "Yes, it's a new way of communicating between people have the same interests, based on sharing knowledge only, which open the field for people who haven't any chance of doing so in another place." (sic) (Written comment by a an online survey participant who is a user of the coworking space Qafeer Labs)

Especially for people who do not have the opportunity to attend the (typically expensive private[37]) schools and universities, which are well-known for their good teaching and education, the chance to gain knowledge, skills and information at innovation spaces may thus be particularly valuable.

To sum it up, both qualitative and quantitative research revealed that Caireen innovation spaces have an impact on users' intellectual capabilities, in terms of increasing their knowledge, skills, and information regarding different topics. Apart from that, it was posited that the way innovation spaces have an impact on intellectual capabilities is closely linked to innovation spaces' cultivation of serendipity, mastery experiences and observational learning.

7.1.4 Impact on users' psychological capabilities

In the theoretical and conceptual framework, it was pointed out that the improvement of social and intellectual capabilities[38] is usually closely related to improvements in psychological capabilities. In particular, improvements of self-efficacy and collective efficacy beliefs were postulated as important, in line with the Bandura's (1995, p.2)

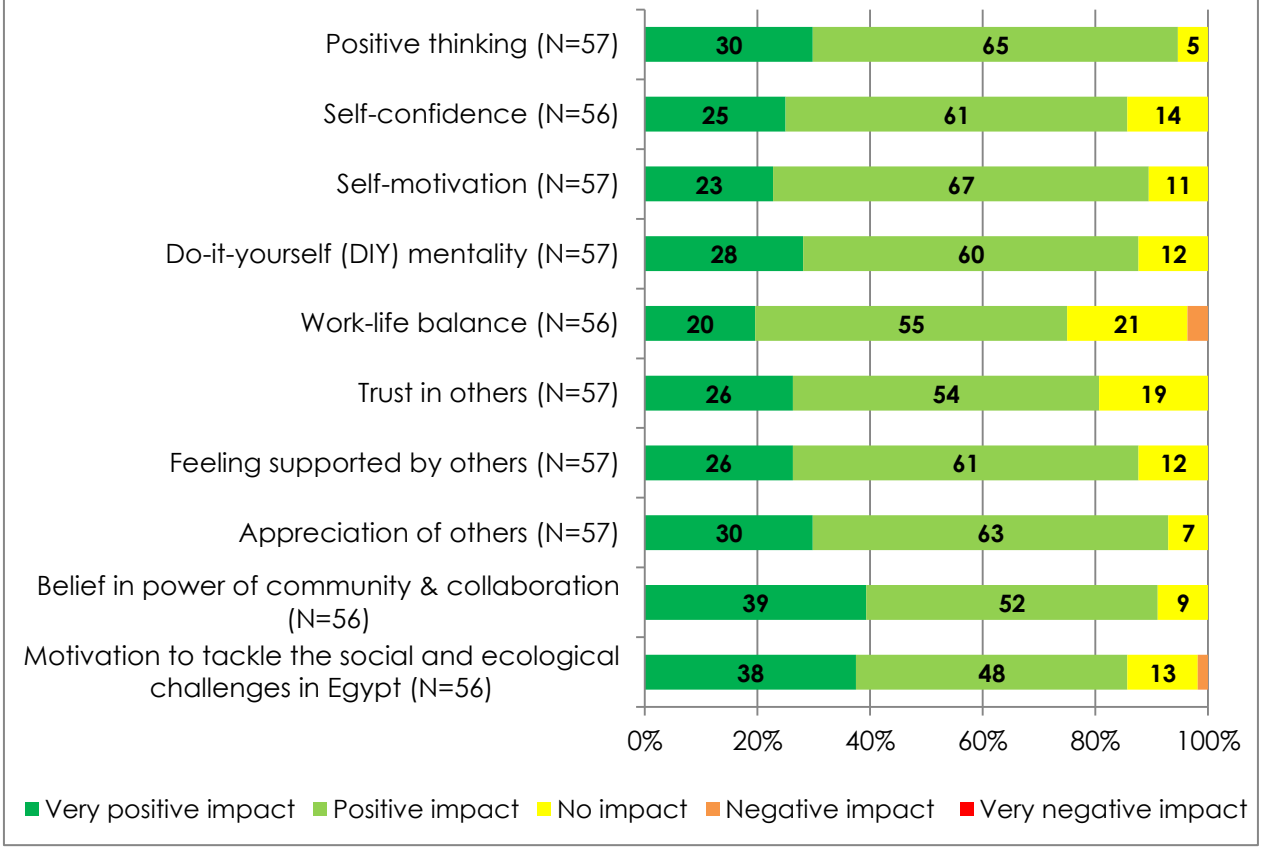
[37] as explained in section 3.3.1
[38] and of performance in projects as will be discussed in the subsequent section

argumentation that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively the case".

And indeed, as mentioned in a previous section, fieldwork in Cairo showed that the impacts clustered here, under the header "impacts on users' psychological capabilities", are among those that were brought up by interviewees most frequently and discussed most fervently. Once again, the section begins with an overview of the types and frequency of impacts on psychological capabilities that were reported in the online survey. On that basis, I discuss what these impacts mean to users and provide an explanation of how these impacts are likely to be brought about by innovation spaces, in relation to Bandura's (e.g. 1995) conceptualization of four sources of efficacy beliefs: conducive emotional states, verbal persuasion and social support, observational learning and mastery experiences.

In the online survey, ten variables were tested that relate to the topic of impacts on psychological capabilities. The first five variables represent indicators of users' personal mentality and, in particular the first four, relate to Bandura's (e.g. 1995) concept of self-efficacy beliefs. These variables are *positive thinking*, *self-confidence*, *self-motivation*, *do-it-yourself (DIY) mentality*, and *work-life balance*. They are, to some

Figure 9. Frequency distributions regarding the question, "How would you evaluate the impact the space has on your attitude and/or mentality?"



extent, related to Bandura's (e.g. 1995) concept of collective efficacy beliefs. These variables are *trust in others*, *feeling supported by others*, *appreciation of others*, *belief in the power of community and collaboration*, and *motivation to tackle the social and ecological challenges in Egypt*.

The frequency distributions of the responses, illustrated in figure 9, show that the large majority of users indeed sees positive or even very positive impacts on these psychological capabilities of theirs. For all ten variables, the response option *positive impact* constitutes the mode, and for all but one variable, i.e. *work-life-balance*, the second most frequently selected response was very positive impact. The highest percentages of responses regarding the positive impact in total were found for the variables *positive thinking*, *appreciation of others*, and *belief in the power of community and collaboration*. The response option very positive impact was selected particularly frequently for the variables *belief in the power of community and collaboration* and for *motivation to tackle the social and ecological challenges in Egypt*. The response options no impact or a negative impact were chosen most frequently for the variables *work-life balance* and *trust in others*. Nevertheless, even for these variables, the overall distribution remains fairly positive (compare figure 9).

So, what do these impacts on psychological capabilities mean to users, and how do they come about? To begin with, please consider the following quotes of two users, who talk about their (first) experiences when using their respective innovation spaces,

> "First time I come here, I was so excited about the place, it was amazing for me. I was miss this place for a long time. First time I come here, it's like you find a treasure or something you really missed." (sic) ("Interview with user of the event/meenting space Beit ElRaseef," 2013)

> "It was like a home. At the very beginning, it wasn't like that. Every day you were putting a new touch to it. […] I remember the day we were trying to fill these bean bags and it was like a wind storm came and all the beans inside was covering the whole place. We stayed the whole day and were trying to clean it… Everything was made by their hands. […] And these wooden chairs and tables – it was a workshop for all the coworkers and they came together to cut it and they were the ones who cut it and put it all together… […] Because we were considering all that our home. We were dealing with each other as a family, one big family. And anyone who would come to this family, he or she would become a new member of this family." (sic) (User A, in "Focus group interview with 2 users of the coworking space The District," 2013)

These quotes illustrate how dearly both of these users feel about their respective innovation spaces, that the space is connected with positive feelings and good memories for them, and that they feel comfortable when going there. In particular the notion of "feeling at home" constituted somewhat of a running theme throughout the interviews I conducted and participant observation I engaged in. However, also the notion of feeling part of a community, as implied in the second quote where the user

talks about "dealing with each other as a family", was brought up again and again. In this context, it may be worth pointing out once again that 56% of online survey respondents completely agreed and 32% somewhat agreed to the statement "there is a strong sense of community between members" (Stercken, 2014, p. 74).

These insights not only provide a deeper understanding of what it may mean for users to experience improvements in their *positive thinking* and their *work-life-balance*; they may also be seen as indicators of people's **emotional states**, which, according to Bandura (e.g. 1995) must be understood as one of the four sources of efficacy beliefs. Arguing along the same lines, one of the managers/users of *The District* told me that the innovation space presumably has an impact on its users in the following way,

> "For them to have a place where they feel positive and inspired and happy to start their day, and feeling empowered themselves, as in 'okay, I'm starting my day. This is what I'm doing'. Feeling a safe place to ask questions, to not have to say, 'oh, everything is well', to the question, 'how is your business?' – 'oh great'. Cause you also have meet-ups like that sometimes. But everybody is struggling and then they feel bad when later in bed. That's also important: Have a safe place, where you can ask questions and say, 'I'm struggling with this. Can maybe somebody help with that?'" (Manager/user of The District, in "Focus group interview with 1 founder and 1 manager/user of The District," 2013)

So through feeling positive and inspired, this manager/user believes that users feel empowered and motivated to start their day and pursue their projects. This line of reasoning may well stand behind the positive responses that 86% of users indicated for the variable *self-motivation*. And indeed, according to Bandura (e.g. 1995), efficacy beliefs contribute to people's motivation.

There is an additional factor mentioned in the previous quote, and that is the idea of having a "safe place to ask questions". It refers to the notion of being able to be oneself, share one's worries and ask for help, and still not be negatively judged but rather feel supported. In that sense, this idea is closely related to a second source of efficacy beliefs, according to Bandura's (e.g. 1995), namely **verbal persuasion and social support**. In this context, consider the following quotes by two users, who talk about the type of social treatment they are used to, when trying to be innovative and try out new things. To understand the quotes better, it may be noteworthy that the first user stems from a different province in Egypt, and the second stems from what could be regarded as one of the "poorer" neighborhoods of Cairo.

> "I found that in my city, my friends think, he think outside of box, and they don't agree. They think he waste his time, he not marry, he's no future. Here in Egypt, we have traditional life: that you graduate, finish early, search for a job here. If you not found, search for job outside country, in Golf countries, other Arab countries. And work for the money, make apartment and furniture here and marry and continue life. And this is process… the typical process of Egyptian men. And for woman: graduate and wait – to marriage. That's all. And marry and get kids and life. But I don't like this type of life. I have found that my voice is that graduate, finish early, after finish early, create my own

> business and grow, grow, grow, and found wife that she is also entrepreneur. (sic) ("Interview with user of the hacker-/makerspace icecairo," 2013)

> "Every people or anyone or anywhere in the world, people always looking, always watching you. Here in Egypt it's more more more more… What do you think if people don't have the idea of your own area, your special area? All the time you find people put their nose here, if you live here for a long time. […] When you go to another places, like library, when I was young, I go to library. It was like schools, have rules, you know? Not difficult rules, but… its rules. […] always close, close, close your mind. Always somebody controlling your mind. Always somebody tell you what you must do and don't do this. This good and that bad." (sic) ("Interview with user of the event/meenting space Beit el Raseef," 2013)

Both of these quotes illustrate how the two users felt rejected in the social environment they spend most of their time in: Be it their family, their friends, institutions like school or the library, they felt like society was trying to force them into the prevailing social norms, which in Egypt largely go against being innovative and taking risk. Both of these users told me that for a long time they had felt discouraged by their environment to pursue their own projects. This goes in line with what Bandura (e.g. 1995) calls negative social persuasion and regards as very effective in destroying people's sense of efficacy.

In that regard, both of these users told me, that joining their respective innovation spaces was of great importance to them, because they suddenly did not feel the same type of social rejection anymore. As voiced by the second user,

> "Everybody here, don't watching you too much, don't think about you too much. So giving you the place to be free, to be yourself. […] Here, without anybody do something for you, but they give you the feel of freedom, you can do what you want. If you want to sing, if you want to dance…" (sic) ("Interview with user of the event/meenting space Beit el Raseef," 2013)

Thus, at the innovation space, the user says that he experiences a sense of "freedom", of being allowed to explore his dreams and pursue his projects. In his concrete case, he told me that he had made some paintings, but that the people in his neighborhood told him that what he did was not Art, thereby making him feel incapable of painting and discouraging him from painting further. In the following quote, he points out how his perception changed when he brought one of his paintings to the innovation space one day,

> "I come here and met [user B] and she like it and she say, 'it's nice work'. I become trust in my ability. […] They help me that one day maybe this man he take a photo and another one. I put it on my site on facebook. So it was amazing for me. If I was alone, I don't have a camera, I don't have a net. So here, I find people help me." (sic) ("Interview with user of event/meeting space Beit el Raseef," 2013)

Thus, instead of rejection, the user suddenly felt supported and encouraged to continue in his endeavors. This shows that verbal persuasion and social support indeed appears to have been an effective source of efficacy beliefs for this user. It can therefore be

regarded as an example of how Bandura's (e.g. 1995) theory comes into play at innovation spaces. It provides some background to the highly positive quantitative results that users report with regards to their *self-confidence,* their *self-motivation*, and their *feeling supported by others*.

Apart from enticing enhanced emotional states and providing occasions for verbal persuasion and social support, the efficacy beliefs of users are also improved through what Bandura (e.g. 1995) calls **social modeling or observational learning** – a concept that was already identified as important in raising users' intellectual capabilities. In the context of increasing users' psychological capabilities, observational learning takes place by way that, at the innovation spaces, users see a lot of like-minded people who try out new things despite the frequent lack of support in other places; and they also observe others persevere in the face of setbacks and experience success in what they are doing. According to Bandura (e.g. 1995), seeing peers succeed, especially those who are believed to be similar to oneself, can be a fairly effective source of efficacy beliefs. The aspect of following the example of social models is demonstrated by the following quote by a *Beit ElRaseef* volunteer,

> "The theme that we give to people when they come, […] opens very many, many ideas and thoughts for people. Some people who didn't do anything before, they love photography. And they started their first photography workshop at ElRaseef. […] And actually, that encourages other people, people doing some…. giving courses in graphics and things like this." ("Interview with Beit el Raseef cofounder/user," 2013)

To encourage people to pursue their projects further, several of the Caireen innovation spaces (*Fab Lab Egypt*, *icecairo, Beit ElRaseef*, *The District* and occasionally others) started to offer explicit events, where users are challenged to talk about their ideas with other users. That way, they not only seek to provide a concrete setting for people with ideas, who procrastinate their implementation, to start putting them into practice. They also want to provide an explicit setting for users to learn from each other's experiences, setbacks and success stories, and to get concrete opportunities for feedback and support from others. In this context, one innovation space manager noted,

> "I feel like people need this kind of push. If you have an idea, just do it yourself, you don't need to wait for funding, for someone to make your idea true. You can just do it yourself and throughout this process of just making it, you learn something new. You meet people, you attend events, you learn more, you end up doing your product, you end up presenting it and maybe actually having something real." ("Interview with icecairo manager 2," 2013)

This line of reasoning closely relates to the hands-on/DIY imperative entailed in innovation spaces' cultural and organizational space. Besides, it relates to the online survey variable *DIY mentality,* wherein 88% of survey respondents indicated a positive impact. Indeed, according to Bandura (e.g. 1995), actually trying things out and

making **mastery experiences** of one's own, is the most effective source of efficacy beliefs, because it allows for a direct judgment of one's own capabilities. On top of that, mastery experiences automatically lead to learning and thus the improvement of, for instance, intellectual capabilities.

In a similar way that innovation spaces raise users' self-efficacy beliefs, they also enhance their collective efficacy beliefs. The same four sources of efficacy beliefs are important in this process (e.g. Bandura, 1995). At innovation spaces, collective efficacy beliefs arise in particular due to the fact that users are enticed to work in groups and collaborate to such an extent. Be it through informal interactions or more structured settings, where users are challenged to discuss their individual projects or participate in events (e.g. hackathons), at innovation spaces users are provided with vast opportunities that may lead to increased beliefs in collective efficacy. That innovation spaces indeed have such an impact on their users seems confirmed by the fact that as many as 91% of online survey participants indicated that innovation space usage had a positive impact on their *belief in the power of community and collaboration*. According to Bandura (e.g. 1995) collective efficacy beliefs are of particular importance, where people work in groups, try to bring about innovation, or social change, in ways that society at large remains opposed to. As many users indeed work on these types of innovative projects, as shall further be discussed in section 7.2, the creation of collective efficacy beliefs appears highly important. Indeed, in the online survey, 86% of respondents indicated positive impacts on their *motivation to tackle the social and ecological challenges in Egypt,* as a result from innovation space usage.

To sum it up, this section has shown that innovation spaces have an impact on users' positive psychological capabilities, by providing them with a positive environment, where they (1) feel enhanced in their emotional states, (2) feel supported rather than negatively judged, (3) can observe like-minded others put their ideas into practice and persevere even in the face of fallbacks, and (4) are provided with opportunities to make mastery experiences of their own. The resulting positive psychological capabilities and efficacy beliefs are not only of relevance to users' well-being in their own accord. They also contribute to users' sense of feeling an agent in the world, which can result amongst others in positive impacts on users' social networking behavior, their learning, and their performance in their own projects. As the impacts on users' social capabilities and intellectual capabilities were already discussed in the previous sections, the impacts on users' performance in their projects is analyzed in the following section.

As a last point here, I would like to stress the relevance of these impacts on the psychological capabilities of users in the **context of current-day Egypt**. As I have argued in my report "The entrepreneurial ecosystem in Egypt: Two and a half years after the revolution of 25 January", prevailing social and cultural norms in Egypt discourage

people from taking risks, collaborating with others, being open about their ideas, innovating, and embarking unconventional carriers. Besides, there is a strong stigma attached to failure. Through literature, interviews with experts and Egyptian entrepreneurs, I found that many young entrepreneurs find continuing, despite the discouragements of family and friends, the most difficult challenge in engaging into entrepreneurship (Stercken, 2013).

These discouraging norms are on the one hand the result of the traditional ideal life plans, which were nicely outlined by a user a few pages earlier. But on top of that, the norms are reinforced by various factors related to the current economic situation in Egypt, where many people are unemployed, the future is uncertain, few investments are made, and to some extent everybody thinks of their own well-being first (Stercken, 2013). The following quotes are representative of the fact that innovation space managers and users are indeed aware of these problems and that they actively want to tackle them. One innovation space manager stressed, "[w]e are changing mentality. So we are fighting a mentality that is the result of the economic conditions that Egypt has been forced into"("Interview with icecairo manager 1," 2013). To specify the type of mentality innovation spaces are fighting and the mentality they want to foster, he said,

> "[W]e also want […] to push Egyptian youth but Egyptians in general to become entrepreneurs and to start their own businesses as opposite to going in that old paradigm of looking for a poor-paying job that doesn't take you anywhere, where a lot of people are kind of negative and kind of stuck in their own mentality, you know, that kind of mentality where they really put people down and suppress creativity and the ambition." ("Interview with icecairo manager 1," 2013)

In this sense, innovation spaces can be thought of as enabling spaces, where psychological capabilities conducive to innovation and entrepreneurship, including going against the norm, are encouraged and cultivated, in the middle of a macro-economically challenging situation, where these types of activities are generally discouraged. All in all, I believe that the following quote sums up the value of the impacts on psychological capabilities fairly well,

> "I think [innovation spaces] will encourage like-minded people to meet, interact and ultimately become more productive. I think it encourages positive action rather than passively accepting this looming air of negativity the country is going through now." (Written comment by a an online survey participant who is a user of the events/meeting space Beit ElRaseef)

7.1.5 Impact on users' performance regarding their individual projects

In line with Sen's (1999) argumentation, the analyzed impacts on users' economic capital, and on their social, intellectual and psychological capabilities should be regarded as valuable in themselves: After all, the identified expansion of users' human capabilities results in increases of users' control over their environment and in that sense results in an enhancement of their 'human agency freedom'. However, beyond the enhancement of 'human agency'[39], the identified capabilities can also lead to improvements regarding users' performance in the different projects they engage in. After all, as pointed out in section 4.3, these four types of capital/capabilities are viewed as important for competitive advantage in today's economy (Luthans et al., 2004; Luthans & Youssef, 2004; Stajkovic & Luthans, 1998).

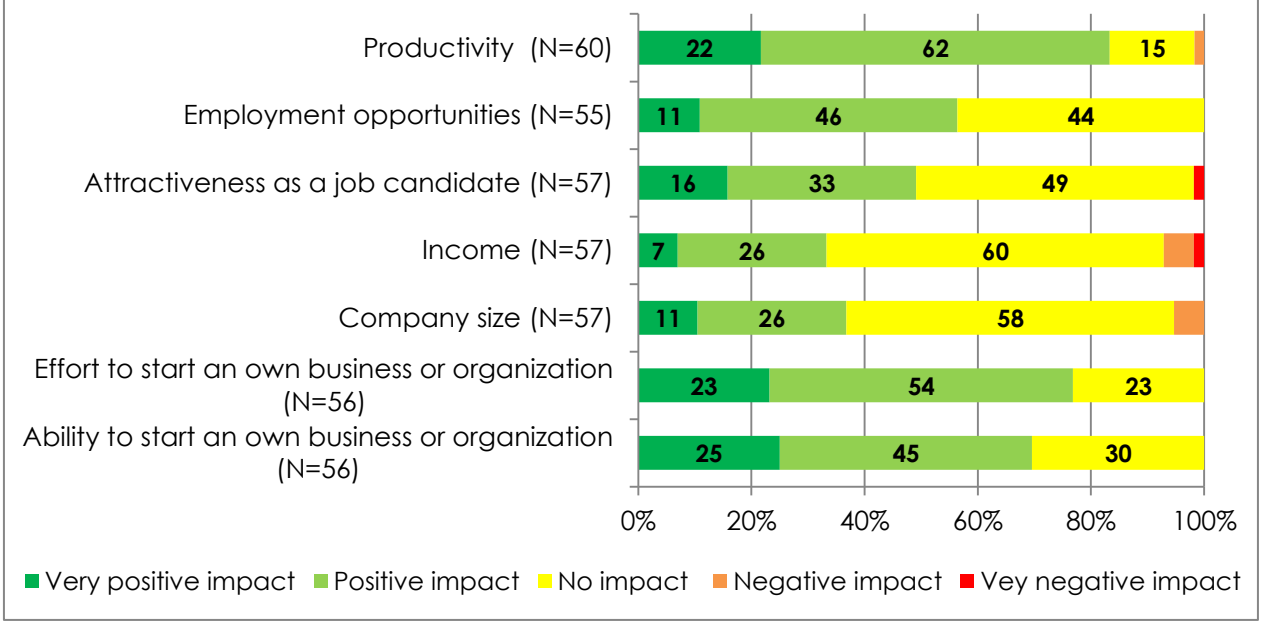
In line with this reasoning, this section analyzes whether innovation spaces indeed improve users' performance in their jobs or projects. Besides, it identifies several correlations that can be made out between concrete performance improvements and the expansion of the capabilities identified in the previous sections.

In the online survey, seven variables were tested that relate to factors regarding users' performance in their projects and to their competitive advantage on the job market more in general. Among these seven variables, one was *productivity* and refers to the general idea of impacts on performance. Two variables, *employment opportunities* and *attractiveness as a job candidate* relate to the advantages users may experience on the employment market as a result of using the innovation space. Two variables, *income* and *company size*, test in how far the advantages on the job market indeed have an impact on users' income and their company, where one already exists. And finally, the last two variables, i.e. *effort to start an own business or organization* and *ability to start an own business or organization*, relate to the more concrete goal of many innovation spaces to direct users onto the path of entrepreneurship.

Looking at the frequency distributions presented in figure 10 reveals that the large majority of users indeed sees a positive (62%) or even very positive (22%) impact on their *productivity*, as a result from innovation space usage. By contrast, much fewer users judged the impacts on their *employment opportunities* and *attractiveness as a job candidate* as positive. A total of 57% saw positive impacts on the former, while a total of 49% saw positive impacts on the latter.

[39] and to some extent also 'human well-being', the latter being a likely result of the improvements of psychological capabilities in particular

Figure 10. Frequency distributions regarding the question, "How would you evaluate the impact the space has on the work on your projects?"



With regards to the variables *income* and *company size*, the majority of respondents saw no impact. It still seems noteworthy that 33% reported a positive impact on their *income*, i.e. roughly six times as many as respondents who reported a negative impact. In these contexts, it seems necessary to point out once more that not all users use innovation spaces for work-related purposes. Some use them to engage in hobby activities, others use them to work in, but have a stable job at a large business or organization. Thus, these types of impacts could be considered as less relevant to them than to others. The corresponding respondents are likely to have indicated no impact on these variables, when given the choice. In front of this background, it is almost astonishing that 77% of respondents indicate positive impacts on their *effort to start an own business or organization*, and 70% indicate positive impacts on their *ability to start an own business or organization*.

So which capability improvements are these impacts on project- or job-related performance related to? To start with, the impacts on users' *productivity* were found to be most strongly correlated to impacts on users' *teamwork*, their *knowledge outside of their own field of expertise,* their *creativity*, *DIY mentality*, *openness to discuss ideas and projects*, *random discoveries and opportunities inside the space* and *inspiration for new ways of doing business* (compare box 4). Thus, innovation spaces' impact on productivity seems particularly related to its impacts on users' intellectual capabilities, in particular those that relate to their (usage of) skills regarding the interaction with others (*teamwork*, *openness to discuss ideas and projects*), their capabilities that concern doing things differently (*knowledge outside own field of expertise*, *creativity*, *inspiration*

for new ways of doing business), and serendipity (*random discoveries and opportunities inside the space)*. Additionally, a proactive *DIY mentality* was found to be important.

Closely related to the idea of productivity improvements, an expert in the field of Entrepreneurship and friend of a Caireen coworker told me that she could see a difference in her freelancing friend's job productivity, since the friend had joined a coworking space.

> "I could see the transformation. She started to be more organized. She is more focused. She doesn't pay much money. And even she started to do some work with people there, cause sometimes these coworking spaces give you the opportunity to talk with people from different backgrounds, from different businesses, doing some kind of collaboration." ("Interview with the entrepreneurship researcher Prof. Hala Hattab," 2013)

Thus, Professor Hattab sees her friend's performance improved, due to her changes in work mentality ("being more organized" and "more focused") which are prospectively related to psychological capabilities, such as self-motivation (compare box 4).

Box 4. Which impacts on human capabilities are most strongly correlated to users' performance?

Correlating all 37 impact-related variables with each other, reveals that nine variables measuring the impact on intellectual capabilities, one variable measuring the impact on social capabilities and five variables measuring the impacts on psychological capabilities are strongly ($r > .5$) and highly significantly ($p < .001$) correlated with the variable *productivity*. The highest correlations, with an effect size of $r > .7$, were found for the variables *teamwork*, *knowledge outside of own field of expertise* and *creativity*. This corresponds to an $R^2 > .49$, and thus to a covariance of at least 49% of answers of these respective variables with *productivity*. With effect sizes of $r > .6$, accounting for a covariance of at least 36%, the variables *DIY mentality*, *openness to discuss ideas and projects*, *random discoveries and opportunities inside the space* and *inspiration for new ways of doing business* were found also to be very strongly correlated to *productivity*. For more information, please look at the correlation matrices below.

Pearson Correlation	Social Cap.	Psychological Capabilities				
	Interaction Ppl Diff. Prof. Backgrounds	Feeling Supported	Self-motivation	DIY Mentality	Work-life-balance	Belief Power Community Collaboration
Productivity	,504**	,531**	,521**	,630**	,502**	,563**

**. Correlation is significant at the 0.001 level (2-tailed).

Pearson Correlation	Intellectual Capabilities								
	Knowledge Field Expertise	Knowledge Outside Expertise	Teamwork	Creativity	Openness Discuss Projects	Give Ask Feedback	Handle Conflict	Random Discoveries Opps Inside	Inspiration New Ways Do Business
Productivity	,569**	,717**	,739**	,727**	,614**	,542**	,573**	,608**	,608**

**. Correlation is significant at the 0.001 level (2-tailed).

In addition to that, Hattab's quote alludes to further benefits for users of innovation spaces, which may result from networking, in particular collaboration and *employment opportunities*. This impact is of course of considerable importance for freelancers, who commonly always have to be on the lookout for employment opportunities. In this context, a user of a Caireen coworking space said,

> "I strongly believe that if there is enough people there who use the place, they have stuff to work and share. Like the people in [company X], they need to hire a third person to work with them, but they don't have the time or money to recruit someone. And they also need someone to run their page and run the Facebook activity. So instead of going outside, they just asked me. We haven't discussed the terms yet, but I will probably tell them […] I need a logo and I'll get you the third guy." ("Interview with user of the coworking space Rasheed22," 2013)

Whereas the employment opportunity discussed in this quote appears to result from a serendipitous discovery inside the space, such opportunities also arise elsewhere, e.g. by way that people from outside the innovation space hear about the space and the types of people and capabilities they host. These people then sometimes approach individual users at these spaces or the spaces as a whole to solve concrete problems for them. For instance, a cofounder/user of *Cairo Hackerspace* pointed out,

> "Sometimes people come ask for some devices here. Like Vodafone asked us to make them an electronic device, so that they can control their billboards in the streets from their home. So we built it for them. […] We don't necessarily know the stuff they want. We just sit together and brainstorm with each other, to see how we can do this." (sic) ("Interview with Cairo Hackerspace cofounder/user," 2013)

Although these kind of employment opportunities from the outside, where basically a "team of users" comes together, brainstorms ideas, invents technologies and implements them, come about rather rarely, this nevertheless constitutes a fairly interesting phenomenon that particularly the hacker-/makerspaces could seek to promote more intensively, if they wished to do so. When asked how *Vodafone* knew about the *Hackerspace*, the interviewee told me, "It's like your reputation. Some guy, when they have this idea, when they know us, they will say, we know a guy who can help you with this idea" ("Interview with Cairo Hackerspace cofounder/user," 2013).

Of course, the reason why people approach users as clients also has to do with the fact that they perceive them as attractive job candidates. In that sense, it does not come as a surprise that the two variables *employment opportunities* and *attractiveness as a job candidate* were found to be very strongly correlated with each other. Besides, in line with the aforementioned quotes, it seems logical to find that the variable *employment opportunities* was rather strongly correlated to *awareness of opportunities at other spaces or organizations* and *random discoveries and opportunities inside the space*; while the variable *attractiveness as a job candidate* was particularly correlated

Box 5. Which impacts on human capabilities are most strongly correlated to the variables attractiveness as a job candidate and employment opportunities?

Correlating the two variables *attractiveness as a job candidate* and *employment opportunities* with each other and with all other variables from the fields of social, intellectual and psychological capabilities reveals that first of all that the two correlate very strongly (r = .735, p < .001) with each other. Besides, it shows that both or either/or of these variables correlate most strongly (r > .475, p < .001) with five variables, of which four measure intellectual capabilities and one measures psychological capabilities. For more information, please look at the correlation matrix. Whereby the intellectual capabilities can presumably be understood as causes of users' *attractiveness as a job candidate* and of their *employment opportunities*, the impact directionality with the psychological capability *self-confidence* appears more unclear.

Pearson Correlation	Intellectual Capabilities				Psych. Cap.
	Knowledge Field Expertise	Knowledge Outside Expertise	Random Discoveries Opps Inside	Awareness Opps Elsewhere	Self-Confidence
Attractive Job Candidate	,490**	,515**	,308*	,366**	,467**
Employment Opportunities	,452**	,467**	,478**	,503**	,525**
**. Correlation is significant at the 0.001 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					

with *knowledge in own field of expertise* and *knowledge outside of own field of expertise* (compare box 5).

As for the more concrete impacts on users' *income* and *company size* that were identified at the beginning of this section, both variables are fairly strongly and highly significantly correlated to the variables *finding clients* and *employment opportunities*. The variable *company size* shares a strong covariance with the variable *ability to start an own business or organization*, and to a lesser extent also with the *effort to start an own business or organization*. For the variable *income*, these correlations were much lower, and it makes sense that when starting a business or organization, the company size would grow, but not necessarily the income. After all, new start-ups typically at the beginning rather require investments than generate income (compare box 6).

Box 6. Which variables regarding impacts on human capabilities are most strongly correlated to the variables *income* and *company size*?

Pearson Correlation	Social Cap.	Users' projects		
	Find Clients	Employment Opportunities	Effort Start Business Organization	Ability Start Business Organization
Income	,520**	,472**	,269*	,371**
Company Size	,499**	,480**	,489**	,552**
**. Correlation is significant at the 0.001 level (2-tailed).				
*. Correlation is significant at the 0.05 level (2-tailed).				

Correlating the variables income and company size with all other impact variables showed that the two are strongly (r = .510) and highly significantly (p < .001) correlated with each other. Apart from that, the variables share most covariance with the four variables indicated in the correlation matrix to the left.

So finally, let us have a look at which capabilities influence the entrepreneurship-related variables. As a reminder, 77% of survey participants evaluated the impact on their *effort to start an own business or organization* as positive, and 70% of respondents saw their *ability to start an own business or organization* as improved (compare figure 10). In the view of the entrepreneurship expert Prof. Hattab, especially the impacts on users' economic capital, their social capabilities and their intellectual capabilities are of importance in the way that innovation spaces support entrepreneurship,

> "If you link this to the money of starting a business, if you think that I need money to buy an office, to do this. What happens is that they spend all their start-up capital on doing these things. These coworking spaces might help them, the entrepreneurs, to have more money to spend on the business itself, on developing the idea, rather than on buying an office etc. So it plays a role, especially with the young entrepreneurs. And again, I think it plays a role, its usefulness is even reaching beyond the idea, it gives you kind of networks. Young people really lack networking and knowledge of different people and different initiatives. We are talking in a coworking space, it helps you to build up a network. You are not working on yourself, closed off with your colleagues and your idea. You become exposed to other people. You start thinking of other solutions. It gives an impact, it builds networks." (sic) ("Interview with the entrepreneurship researcher Prof. Hala Hattab," 2013)

According to this quote by Prof. Hattab, coworking spaces (and by extension the other types of innovation spaces, which Prof. Hattab was less aware of), innovation spaces have an impact on entrepreneurship, by providing an impact on economic capital, as the usage of coworking spaces allows users to save money, which can then be "spen[t] on the business itself", instead of on rent. She further sees the impact on users' social capabilities, through the networks users build at these spaces; and she sees an impact on intellectual capabilities, as users get exposed to new ideas and "start thinking of other solutions". In her opinion, these types of impacts are particularly relevant to young entrepreneurs, who in her experience lack knowledge and networks, and often forget about options such as outsourcing, when requiring services for their start-up. Instead, they often try to find an appropriate start-up team member, who has these skills, although this may entail many more inconveniences and complications ("Interview with the entrepreneurship researcher Prof. Hala Hattab," 2013). The one category of capabilities that Hattab does not mention here, is impacts on psychological capabilities.

In this sense, it seems particularly interesting that both entrepreneurship variables have the highest amount of strong and medium correlations with variables regarding the measurement of impacts on psychological capabilities. In fact, the only two variables that are strongly correlated to the entrepreneurship variables are *impact on feeling supported by others* and *impact on trust in others* - two variables that not only relate to users' attitude towards others but also to Bandura's (e.g. 1995) sources of efficacy beliefs. On top of that, the variables *self-confidence*, *self-motivation*, and *DIY*

mentality, all of which were presented as indicators of impacted self-efficacy beliefs, were found to be moderately correlated to the *effort to start an own business or organization*. The indicator of collective efficacy beliefs, *belief in the power of community and collaboration*, was moderately correlated to both entrepreneurship variables. Similarly, the intellectual capabilities *knowledge outside own field of expertise*, *ability to ask for, give and receive feedback*, *awareness of opportunities at other spaces and organization* and *awareness of the social and ecological challenges in Egypt* were found to be moderately correlated with both the *ability* and the *effort to start an own business or organization*. In contrast to that, *finding partners or employees* and *openness to discuss ideas and projects* was found to be more correlated to the *ability of starting a business or organization* than the *effort* of doing so (compare box 7).

Box 7. Which impacts on human capabilities are most strongly correlated to users' commitment to entrepreneurship?

Correlating the variables effort to start an own business or organization and ability to start an own business or organization with all variables relating to the measurement of social, intellectual and psychological capabilities reveals that fifteen other variables are positively correlated to one or both of the entrepreneurship variables, with an effect size of r > .4. Of these 15 variables, eight measure impacts on psychological capabilities, six measure impacts on intellectual capabilities and one measures impacts on social capabilities.

Pearson Correlation	Psychological Capabilities							
	Self-confidence	Feeling Supported	Self-motivation	DIY Mentality	Work-life-balance	Trust in Others	Belief Community Collaboration	Motivation Tackle Socio-Eco Challenges
Effort Start Business Organization	,450**	,538**	,449**	,406**	,430**	,528**	,408**	,403**
Ability Start Business Organization	,356**	,508**	,388**	,386**	,359**	,557**	,437**	,390**
**. Correlation is significant at the 0.01 level (2-tailed).								
*. Correlation is significant at the 0.05 level (2-tailed).								

Pearson Correlation	Social Cap.	Intellectual Capabilities					
	Find Partners Employees	Knowledge Outside Expertise	Creativity	Openness Discuss Projects	Give Ask Feedback	Awareness Opps Elsewhere	Awareness Socio-Eco Challenges
Effort Start Business Organization	,386**	,437**	,408**	,366**	,436**	,476**	,451**
Ability Start Business Organization	,412**	,412**	,359**	,410**	,409**	,414**	,462**
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

To conclude, this section showed that innovation spaces have an impact on users' performance in their projects and on their competitive advantage on the job market. In line with Luthans' and colleagues' (Luthans et al., 2004; Luthans & Youssef, 2004) argumentation as well as that of Sen (e.g. 1999), it was argued that these impacts are to great extents related to the impacts on users' economic capital as well as to the impacts on their social, intellectual and psychological capabilities. Whereby the impacts on users' productivity were very strongly correlated with a wide range of capability enhancements from all different categories, the impacts on employment opportunities and attractiveness as a job candidate were mostly related to improvements in intellectual capabilities, including the discovery of serendipitous opportunities. Impacts on income as well as company size were mostly correlated to other factors regarding users' performance in projects as well as to social networking impacts. And finally, the two variables relating to entrepreneurship were most strongly correlated to enhancements in users' psychological capabilities, in particular those related to users' efficacy beliefs. Apart from that, they were moderately correlated with improvements in users' intellectual and social capabilities.

7.2 Indirect impacts of innovation spaces: Innovation-creation and -distribution through users' projects

While section 7.1 dealt with the direct impacts of innovation spaces on their users and on their users' projects, this section speaks of impacts that reach beyond the immediate users. In line with Sen (e.g. 1999), it is argued in this section that, by enhancing users' capabilities and improving their performance regarding projects, innovation spaces have the potential to bring about an impact on human development more broadly, because many of these projects contribute to economic production and social change. To provide a deeper understanding of the type of local development, economic production and social change that can be expected to be catalyzed through innovation spaces, section 7.2.1 provides an overview of the different types of projects that innovation space users in Cairo engage in. In particular, the types of innovation and their potential for locally-induced social change are stressed. To discuss this potential, I not only make use of the data collected at Caireen innovation spaces, but also draw from the experiences made at other innovation spaces in the so-called Global South, as presented at *Re:publica 2014*. Afterwards, in section 7.2.2, I briefly discuss the issue of distributing the innovations that are created at innovation spaces to a broader audience.

7.2.1 Users' projects, innovations and their potential for social change

Although not all innovation space users actually work on projects that could be deemed "innovative", from my experience, I would say that there clearly is an innovative buzz in the air. Innovation is a concept talked about a lot, and in different ways, the type of projects users engage into can be considered as innovative, as defined in section 3.1.1.

To begin with, many users at innovation spaces are engaged in developing various types of technology innovations. Among these, one can distinguish between software and hardware innovations. Most of the **software innovations** that are worked on concern the development of mobile applications. While such innovations may contribute to economic production, create a few jobs through start-up businesses and may indeed be of value to a few members of society, by and large, in Cairo, they do little to entice social change and expand the human capabilities of the population. The reason is that the large majority of solutions developed by Caireen software developers are mostly for wealthy consumers with high-end smart phones ("Interview with the entrepreneurship consultant Hayk Hakobyan," 2013). Yet, there are of course exceptions[40]. For instance, at *Fab Lab Egypt*, there is a user who is developing a small electronic board that monitors agricultural fields and crops, by measuring and providing constant updates on temperature, humidity etc., thus allowing farmers to make more informed decisions on how to administer their fields ("Interview with Fab Lab Egypt cofounder/user," 2013). So software solutions and mobile applications for base of the pyramid consumers are certainly imaginable, but they are not very common in Cairo or Egypt so far, whether at innovation spaces or elsewhere ("Interview with the entrepreneurship consultant Hayk Hakobyan," 2013).

In contrast to that, a higher number of innovation space users work on **hardware solutions**, which could, similar to the aforementioned electronic board, be attributed the label 'appropriate technology'. According to Steward (1983, as cited in Fu, Pietrobelli, & Soete, 2011, p. 1209), **'appropriate technology'** is "a technology tailored to fit the psychosocial and biophysical context prevailing in a particular location and period". Thus, in the Caireen or Egyptian context, an appropriate technology would be technology that fits the Caireen or Egyptian psychosocial or biophysical context of the current day. Going beyond this definition, I would argue that, at innovation spaces, especially those with strong hacker/maker tendencies, increasingly many hardware solutions are developed that seek to contribute to social change by providing solutions to local challenges. For example, at *icecairo*, several projects were running under the

[40] For an example of a "mobile for development" application, developed at an innovation space in Nairobi, please read appendix 1.1.

Figure 11. Building a DIY solar water heater

Figure 12. The final DIY solar water heater

topic of renewable energy. In this context, several hackathons were organized, where the *icecairo* members first built a solar water heater (see figures 11 and 12) and later a solar cooker, in a community effort, based on an open-source version they had found on the internet, and after adapting it to fit the local context ("Interview with icecairo manager 3," 2013).

Apart from that, at all Caireen hacker-/makerspaces, there were individuals interested in building their own personal fabrication technologies, such as 3D printers, laser cutters, etc. It is noteworthy though that the degree to which such projects can be viewed as innovative and valuable in terms of appropriate technologies varies to some extent, and there is a considerable degree of learning taking place within and between the innovation spaces in Cairo and Egypt[41, 42] (compare box 8) (Agrivina et al., 2014; "Interview with icecairo manager 3," 2013).

Next to (appropriate) technology innovations, many users of innovation spaces in Cairo are involved in different forms of **activism**, some of which are new in their localities and all of which seek to bring about social change, regarding different topics. To give some examples, at *Rasheed22*, there were three different anti-harassment initiatives that made use of the coworking space as their headquarters. The most prominent of these is *HarassMap*, an organization that tracks and **raises**

Figure 13. Screenshot of the HarassMap's map[43]

[41] At *Re:publica 2014*, it became apparent that the DIY manufacturing of personal fabrication technologies, is, is a very common endeavor at innovation spaces throughout the world, be it in countries of the so-called Global North or such of the so-called Global South.

[42] For further examples of interesting appropriate technologies worked on at innovation spaces elsewhere in Egypt and throughout different countries in the Global South, please read appendix 1.2.

[43] Source: http://harassmap.org/en/

awareness of cases of through the crowdmapping tool *Ushahidi*[44, 45] (see figure 13) ("Interview with user of the coworking space Rasheed22," 2013).

Apart from that, almost all of the Caireen innovation spaces host groups of users which attempt to create a difference in the field of **education**, which, as mentioned in the contextualization section, is of particularly low quality at many public schools and also universities. Thus, for instance, several student organizations at *Mesaha* provide employability-enhancing skills trainings to other students, e.g. by teaching foreign language skills ("Interview with Mesaha cofounder," 2013). *Fab Lab Egypt* and *icealex* provide technology trainings at and for students at primary, and secondary schools. In addition to that, *Fab Lab Egypt* even helped several STEM[46] schools in setting up fab labs of their own ("Interview with Fab Lab Egypt cofounder/user," 2013).

Multiple projects at innovation spaces also work with students from the Middle East and what is commonly referred to as "the West" to promote **cross-cultural understanding**. As one example, *Rasheed22* hosted events, called *The Virtual Dinner Guest*, whereby individuals or groups of people have dinner together, while having a political discussion via skype, with others from different countries and cultural backgrounds ("Interview with user of the coworking space Rasheed22," 2013).

Figure 15. Makers at the Young Fab Academy[47]

In addition to that, a number of initiatives surround the topic of **political participation**. For instance, at *Mesaha*, there were multiple student organizations that sought to objectively inform people and entice them to vote in the first free elections after the end of the Mubarak regime. Besides, to support youth participation, *Mesaha* managed to introduce the idea of youth representatives in different governorates of Greater Cairo[48]. In addition to that, multiple user projects work in the field of **development/poverty-**

[44] *Ushahidi* is a famous open-source crowdmapping tool, devised by the *iHub* community in Kenya. It is now used in a variety of contexts, typically for awareness-raising purposes (Manske, 2014).

[45] For examples of similar awareness-raising activities at innovation spaces throughout the Arab world, please read appendix 1.3.

[46] STEM stands for Science, Technology, Engineering and Mathematics.

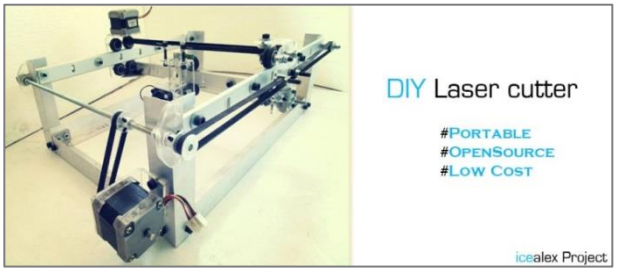
[47] Source: https://www.facebook.com/photo.php?fbid=10152008653875385&set=oa.259425417508176&type=1&theater

[48] These youth representatives not only bring a younger perspective into the Egyptian political structures where the vast majority of political representatives are in their 60s and 70s (Kingsley, 2014), they also connect the political governance with the youth-led initiatives implemented at *Mesaha*. For example, the youth representatives link *Mesaha* user projects working on innovative ways to keep public areas clean with the waste management department of the Caireen governorates.

Box 8. DIY manufacturing of personal fabrication machinery: Varying degrees of innovativeness and appropriateness

icecairo received its first personal fabrication machines through the *large development cooperation organization*. These were not appropriate technologies: they were highly expensive, industrial-size machines, which require a very high amount of energy and are difficult to maintain locally ("Interview with icecairo manager 3," 2013). In contrast to that, the initial team surrounding *Cairo Hackerspace* assembled its first 3D printer in a community team effort – based on a do-it-yourself kit, which they had previously bought at the *Maker Faire*. While *Cairo Hackerspace's* 3D printer is unsurprisingly less powerful than *icecairo*'s industrial one, it is nevertheless suitable for many activities the hackerspace members engage in, and it can be regarded as a more appropriate technology, as it is much more affordable and the users are able to maintain it themselves ("Interview with Cairo Hackerspace cofounder/user," 2013). Yet, even in the case of *Cairo Hackerspace,* simply following the *Makerbot* instructions cannot be considered as very innovative. Thus, consider, the approach taken by fellow makers at *icealex*, a sister hub of *icecairo*, in Alexandria, Egypt, which runs under the name *Resha*.

5th prototype of the *Resha* DIY laser cutter[49]



A local member approached *icealex* with the idea that she wanted to build a laser-cutter, which would be cheap, portable, low-power, made of local materials, easily understandable and operable by mobile phone, replicable and scalable, and thus suitable for usage by Egyptian crafts-(wo)men, who could thereby engrave on fabric. When one of the managers of *icealex* asked her, whether she already had a team for that project, she said that she did not. So they started a *Facebook* event, inviting anyone interested to join, despite not knowing yet, how it would work. To give an idea, they put the example of the *Micro-Slicer*, an open-source laser cutter they found on the user-created online platform for DIY projects *Instructables*. 14 people actually showed up to the event. They came from various technology-related disciplines, and included electronics engineers, mechanical engineers, and hobbyists. Indeed, after initial doubts, just two hours later, the participants had devised an entire to-do list. Two days afterwards, one of the attendees had already come up with a new design that was different to the one on *Instructables*, and another week later a further design was made, including iterations concerning the electronics. 10-12 people were still on board of the project several months later, in May, when *Re:publica 2014* took place. By that time, the team had built and tested four different prototypes, one improving the mistakes of the other, and were under the impression that after two more iterations, they would arrive at the final laser-cutter for crafts(wo)men. Apart from having developed a considerable amount of knowledge and skills this way, the team also decided to bring this product to market, and consequently launched an online crowdfunding campaign in the summer of 2014 (Moushira Elawy, in Agrivina et al., 2014).

[49] Source: http://icealex.com/?page_id=24

reduction. In particular, several student organizations at *Almaqarr* and *Mesaha* devised innovative ways for collecting donations and conduct projects in the poor neighborhoods of Cairo and elsewhere.

Quite different from that are the types of **creative projects concerning arts, music and culture**, which users primarily engage in at *Beit ElRaseef* (see figure 16). In these, users draw and paint, produce pottery and clothes, design crafts and engage into film and photography; they form musical bands and theater groups. And finally, users exhibit their artworks; they sell their crafts; they perform their music or plays on *Beit ElRaseef*'s stage and are encouraged to do so in other places as well. Besides, they pass on their knowledge and skills to other users, by giving workshops, according to the principle that everybody has something to teach, from which others can learn ("Interview with Beit el Raseef cofounder/user," 2013).

Finally, a lot of the projects at innovation spaces circle around the topic of **supporting entrepreneurship**. These projects either seek to raise awareness of innovative and entrepreneurial approaches, as done by the *TEDx* and *AISEC* branches, from three different Caireen universities - all of which hold their meetings at *Almaqarr* and thus cross-pollinate each other with ideas ("Interview with Almaqarr cofounder," 2013). At *Mesaha*, the entrepreneurship-support-organization *Yomken* is a particularly well-known user start-up: It serves artisans and manufacturing site owners, by providing an online platform for open innovation and crowdfunding[50] (compare Stercken, 2013).

To sum it all up,many, though clearly not all, projects that innovation space users engage in are innovative in ways that see k to bring about social change, be it through the invention of appropriate technologies, or activism and civil engagement in fields as diverse as anti-discrimination, education, cross-cultural understanding, political participation, poverty reduction,

Figure 16. A concert at Beit ElRaseef[51]

[50] In terms of open innovation, users can post challenges they face online, while anyone who has ideas for solutions to these challenges can submit them online in exchange for a potential reward. In terms of crowdfunding, entrepreneurs can post their ideas for products on the platform together with the necessary amount of funding. People interested in buying these products can then decide to pay the entrepreneurs in advance, in order to help finance the production line. If the required amount of funding is not reached, the potential buyers receive their money back (compare Stercken, 2013).

[51] Source: https://lh5.googleusercontent.com/proxy/zYHHH-uMG3CiI8Zm7a-k28km-ezFcdRpiF47Gtx7boMCfZ9o9GVlEXBHPE3BaCmatvsob5u7Y7ExXz38XZoL4ZzCucVyZSrw8x59brrBGg%3Dw426-h240-n

arts/music/culture, and entrepreneurship. So as many user projects try to tackle local problems and challenges, one can definitely say that they hold a potential for local development, economic production and social change.

7.2.2 Distributing the innovations to create social change

Of course, the potential of users' projects and innovation activities, identified in the previous section, can only result in actual impacts on human development more broadly, when these projects are successful at achieving their goals. Unfortunately, it is too early to speak of great success stories in this regard, as most of these projects are still in their initial phase. Nevertheless, I would like to draw attention to the issue of **distributing/spreading/scaling** the types of innovation that are devised at innovation spaces. In the following, I outline three approaches to scaling innovation, namely (1) commercialization through the creation of entrepreneurial start-ups, (2) collaboration with the established industry or conventional organizations, and (3) spreading innovation through the open-source.

As became obvious at multiple points of this study, some of the innovation projects at Caireen innovation spaces actually lead to the foundation of concrete businesses or social **start-ups**, whether of for-profit or not-for-profit character. Nevertheless, at least at the time of fieldwork, based on my participant observation, I was under the impression that the percentage of people who were actually in the process of starting up businesses or organizations was relatively small as compared to the total amount of users and also as compared to the total amount of innovation activities. In my perception, the amount of people at innovation spaces who were engaged in hobby activities, freelance activities, or student organizations was much higher. That is not to say that these activities are not innovative or not valuable to human development, but they are typically more short-lived, as freelance activities are mainly project-based, and student organizations fluctuate with the students ("Interview with Almaqarr cofounder," 2013, "Interview with Mesaha cofounder," 2013). A similar problem may exist for many of the hobby activities users engage in, because hobbyists typically do not have an intrinsic motivation to spread their innovations to large amounts of people. Therefore, these innovations may not reach their full potential.

Thus, it is somewhat surprising that, in contrast to my observation, the fairly high percentage of 42.7% of respondents (N=110) indicated to be entrepreneurs – thus making it the occupational status most frequently reported in the online survey[52]. The

[52] The second most frequent was employees of companies and/or organizations[52] (37.3% in total), third students (28.2%), fourth freelancers (20.0%) and least frequent "currently unemployed" (10.9%). This adds up to a total of 139.1% case responses, implying that a considerable number of individuals indicated to have more than one occupational status.

answer to this contradiction may lie in the fact that a lot of the people, who consider themselves entrepreneurs, work on such early-stage entrepreneurial activities, that I did not necessarily perceive them as such. Some of these users merely have an idea, but not yet a team, much less an actual start-up. Yet, the fairly positive impacts that were found on users' *effort* and *ability to start a business or organization*, suggest that users at least have the intention to become entrepreneurs, and that their engagement in entrepreneurship may grow in the future. Thus, the encouraging atmosphere and the promotion of entrepreneurship from the side of innovation space founders/managers but also from the community as a whole may reap their benefits in the long run. Whether the entrepreneurial activities will be carried out to the end, result not only in the foundation, but also in the growth and success of start-ups remains to be seen. At the time of fieldwork, I only saw a limited number of commercialization efforts.

And indeed, there are skeptical voices about the question of scaling. At *Re:publica 2014*, the Berlin-based urban and economic geography researcher Bastian Lange pointed out that he is doubtful about whether bottom-up maker approaches could develop into mature **industry**-like culture. He believes that "probably these makers can only secure their quality when they stay small". Besides, he said that the type of innovations devised at innovation spaces currently run in parallel to rather than complementary to industrial ones[53]. Thus, mass production as the most effective way of spreading innovation seems difficult with the types of innovation devised at innovation spaces (Bastian Lange, in Ehmke, Bastawy, & Lange, 2014).

However, Troxler (2014) points out that mass product is progressively losing its importance, because consumer personal fabrication technologies allow production move from global supply chains to local ones. For him, the users of innovation spaces stand at the forefront of a new way of spreading innovation, namely through open knowledge-sharing, linked to ideas like open-source and creative commons rather than patents and copyrights (Troxler, 2014).

And indeed, in particular when looking at the studied hacker-/makerspaces, it becomes apparent that there are quite a few efforts to spread innovations in an open manner, instead of or in addition to distributing them through commercialization. After all, the hackers/makers at the innovation spaces not only base many of their own projects on others which they find on the internet. They adapt the approaches they find online to better fit their needs, as elaborately explained e.g. through *icealex*' laser cutter project (box 8). Afterwards, they feed the knowledge they acquire back into the open-source/creative-commons, so that other hackers/makers around the world can

[53] Yet, he sees the maker movement as valuable in showing people alternative/future models to established systems that society is becoming increasingly skeptical about, especially since the series of crises that started with the Leeman brothers (Bastian Lange, in Ehmke, Bastawy, & Lange, 2014).

learn from their innovations and adapt them to their particular local contexts. Rather than to produce things for other people, the goal at hacker-/makerspaces is to some extent rather to **inspire** other people to become hackers/makers themselves, so that these can build their own solutions. As the cofounder of *Fab Lab Egypt* pointed out,

> "What I'm dreaming of is to have such a space, a fab lab or hacker or maker space in every street. For example, so people can think of their own, local problems and solve them themselves, by using the skills, the tools of the maker space they have in their street. […] If we have more and more spaces like that and more people to understand what are maker spaces all about, I think this would be a really good step. […] So there's a very good phrase I like, 'solving local problems by global solutions'. Because the making culture is a global thing. Everyone is collaborating to the making culture and everybody is sharing. So we can easily solve our own problems, by getting global solutions. It could be local solutions, it could be global solutions as well." (sic) ("Interview with Fab Lab Egypt cofounder/user," 2013)

The question is of course whether this kind of approach is realistic and sustainable, in terms of: how many people are actually willing to become hackers/makers?, and is it only a trend that will wear off over time? It remains to be seen how the current hype develops (Troxler, 2014). In the Caireen context, scaling the impact at least worked so far in that many of the existing spaces inspired the foundation of others. For instance, based on some talks and presentations, *Cairo Hackerspace* as well as *icecairo* representatives gave in Alexandria, Alexandrians became enthusiastic about the ideas and decided to found two spaces of their own: *Hackerspace Alexandria* and *icealex*.

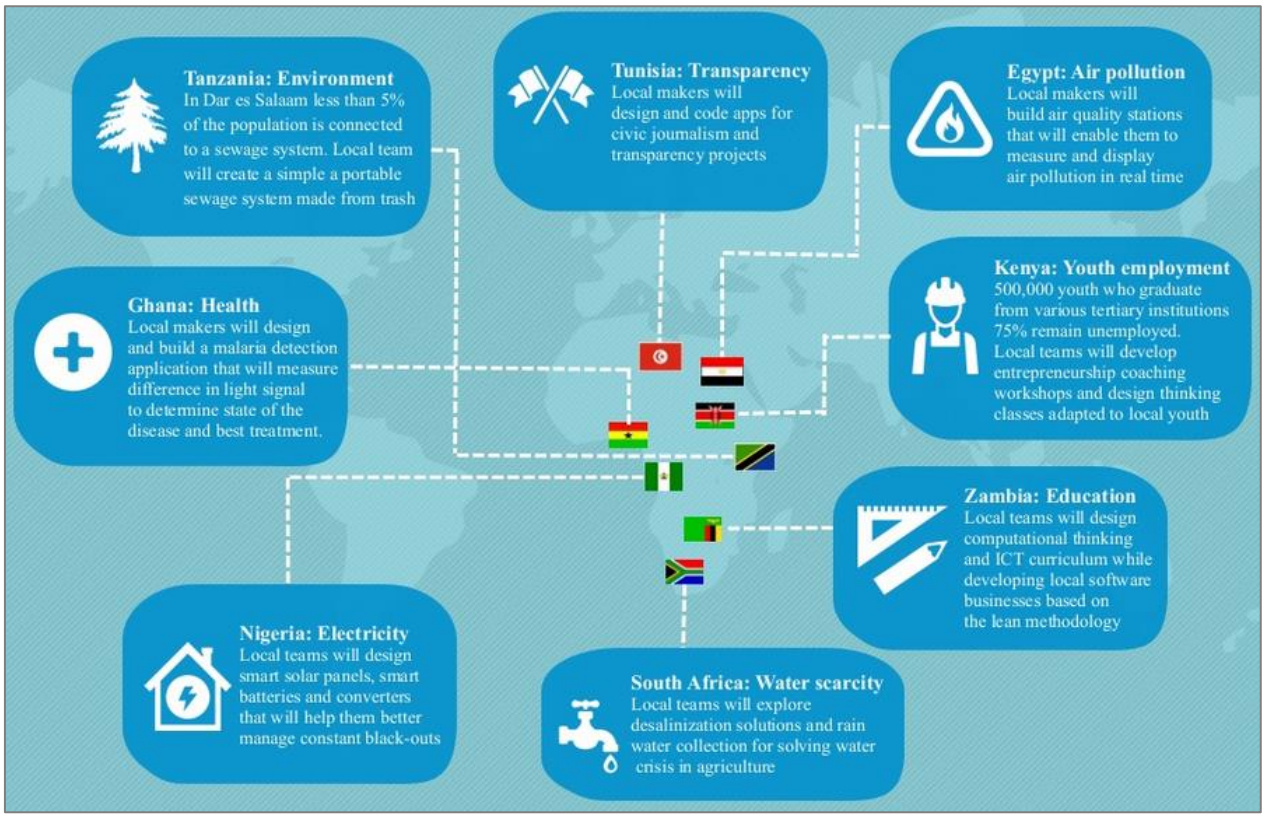
Another trend that appears worth keeping an eye on in this context is the growth of **trans-local networks** around these innovators and their innovation spaces. Such networks are currently growing between innovation spaces around the world, and notably (also) between innovation spaces in different countries of the so-called Global South. These linkages come about bilaterally, e.g. through global conferences like *Re:publica*, or through regional or global innovation space networks, such as *AfriLabs*, the *Impact Hub* network, the *Global Fab Lab* network, etc. For example, as a result of the contacts between different innovation space managers across Africa and the founder of *HacKIDemia*[54] made at *Re:publica 2013*, several innovation spaces decided to start a new collaborative network, which calls itself *AfriMakers*. Channeled through the participating African innovation spaces, and applying the *HacKIDemia* model, *AfriMakers* train a number of local mentors to hack/make and invent solutions to the biggest problems they are experiencing locally. An overview of these challenges and

[54] *HacKIDemia* is a social enterprise which introduces children to the hacker/maker world through hands-on workshops at public and private schools throughout the world. These workshops are always related to topics of developing solutions themselves, to solve local challenges. That way, *HacKIDemia* seeks to support children's Science, Technology, Engineering, Arts & Design and Mathematics (STEAM) education, teach them 21st century skills and enable them to become innovators and change-makers in the future ("Hackidemia," 2014).

what African teams seek to do to solve these is presented in figure 17. Afterwards, these mentors transfer their skills in a simplified manner to local children through hands-on workshops. Besides, the *AfriMakers* in different countries collaborate, when working on similar challenges, so that the developed solutions, knowledge and innovations, can be exchanged throughout the continent in a trans-local manner (Agrivina et al., 2014).

What becomes clear through the establishment of this network is that it actively counter-acts stereotypical knowledge transfer directionalities. As noted by an *AfriMaker* representative from *icealex*, "We are trying to build this ecosystem between the African makers to work together. Instead of having the idea of a white guy that went to Africa to teach them everything, now we have the African-to-African collaboration." (Ahmed Bastawy, in Agrivina et al., 2014).

Figure 17. Local challenges that AfriMakers seek to tackle[55]



To sum it up, multiple pathways are imaginable for distributing the innovations devised at innovation spaces in Cairo and throughout the world. The most evident pathway may be to commercialize these innovations through traditional businesses or social start-ups. Although there is already some entrepreneurial activity happening at Caireen innovation spaces, a lot of it is currently still so early-stage that it is difficult to speak of

[55] Source: http://www.youtube.com/watch?v=OsJYcVKzYwI

success stories. A second pathway could be collaborations with industry. However, this was hardly a topic at the Caireen innovation spaces I visited, and it may be a difficult path if the innovation activities are indeed in parallel rather than complementary to industrial solutions. Nevertheless, several innovation spaces are indeed working on the building collaborations with established companies, governments or large international NGOs and development cooperation organizations. The third and last pathway for scaling innovation could be through open knowledge-sharing of innovations and related approaches, between innovation spaces, and between innovators throughout the world. This is something which is already happening, and it remains to be seen in the future, in how far it will succeed.

8. Conclusion

This thesis dealt with the overarching research question, "In how far do (Caireen) innovation spaces have an impact on human development, (a) directly in terms of expanding the capabilities of their users, and (b) indirectly in terms of creating social change through the various types of innovation activities which users engage in?"

In the thesis, it was argued that innovation spaces, through their integrated implementation of five **'enabling' space dimensions** (architectural space, technological space, virtual space, but in particular social space and cultural & organizational space), have an impact on their users' human capabilities as defined by Sen's capabilities approach. Through case study comparison of ten innovation spaces in Cairo, based on participant observation, in-depth interviews with both innovation space users and founders/managers and through the results of an online survey with the users, it was found that innovation spaces indeed have an impact on their users' (1) **economic capital**, (2) **social capabilities**, (3) **intellectual capabilities**, and (4) **psychological capabilities**. While the impacts on economic capital mainly resulted from the physical space dimensions of innovation spaces, the impacts on users' capabilities resulted to large extents from the less tangible innovation space dimensions (the social, and cultural & organizational space).

Two concepts were identified as particularly important in explaining these impact chains. Firstly, the concept of **'serendipity'** explains how users make contacts and build networks (social capabilities) at innovation spaces. Besides, it explains how these contacts at times raise users' levels of information and knowledge regarding different topics (intellectual capabilities). This in turn oftentimes improves users' performance, regarding their projects and innovations. Secondly, the **'self-efficacy theory'** provides an explanation to the heightened sense of self-efficacy and collective efficacy, expressed through the positive impact on users' psychological capabilities: Innovation spaces have the potential to (a) improve users' **emotional states**, and further, they provide users with occasions of (b) **verbal persuasion**, (c) **observational learning**, and (d) **mastery experiences**. At the same time, as a result of the improved psychological capabilities, cognitive, motivational, affective and selection processes are triggered, which improve users' learning behavior and thus their intellectual capabilities. Apart from that, these enhanced efficacy beliefs regarding different capabilities have an impact on the actual performance of the corresponding functionings.

So what does this imply for human development? According to Sen's capabilities approach, the improvement and expansion of users' capabilities should be seen as valuable to human development in itself, because it enhances these users' **agency freedom**, i.e. their ability to pursue the kind of goals they value. However, the

argumentation in this master's thesis goes that the impact of innovation spaces have an impact beyond the mere expansion of agency freedoms: By converting capabilities into functionings, in particular with respect to innovation and entrepreneurship, users create agency achievements which have the potential to instigate broader economic and social change in their local environments.

In line with this argumentation, the second part of the analysis exemplified the type of projects Caireen innovation space users are working on and the type of innovations these may entail. That way, it became clear that many, though clearly not all, users are innovating in the field of **appropriate technologies** and aim to solve local challenges. Other users work on social projects, which are innovative in the way that they seek to bring about **social change** in terms of education, poverty and social justice, discrimination of sexes, political participation and youth empowerment, ecological sustainability, arts, music and culture etc.

Whether the innovations started at innovation spaces will actually translate into viable and scalable businesses and social start-ups remains to be seen. At the time of fieldwork, in Cairo, most of the innovation activities were very early-stage; there were only a handful of users who actually sought to commercialize their innovations, and spread them by starting up formal businesses or organizations. At the time, many of the social innovation activities remained student-organization-based and consequently often relatively short-lived, and many of the technology hacks performed at hacker-/makerspaces served for learning and entertainment purposes more than necessarily for actually implementing, distributing and scaling them.

Nevertheless, it must be kept in mind that most of the innovation spaces were fairly young at the time of fieldwork; eight out of ten were started less than one and a half years prior to fieldwork, and several were not even officially launched at the time of fieldwork. Besides, increasingly many of the founders/managers and communities surrounding these innovation spaces are promoting the entrepreneurial path, not least through trainings offered by or at the innovation spaces, often in partnership with other entrepreneurship support organizations. Thus, it remains to be seen and re-evaluated in the future in how far the innovations instigated at innovation spaces will effectively be **scaled**, be it by commercializing them through start-ups, by improving collaboration with the mainstream industry or not-for-profit organizations, or through open knowledge-transfer between innovators and innovation spaces throughout the world.

9. Discussion and Recommendations for Future Research

The exploratory research presented in this master's thesis generates a first overview of the different types of impacts innovation spaces may have directly on their users and indirectly on human development more broadly, beyond the immediate users, in the context of countries in the Global South.

In relation to prior research, it firstly needs to be remembered that there have hardly been any academic contributions on this topic. Nevertheless, this study supports the verbally pronounced hypothesis by Friederici (2014) that innovation spaces are **different than start-up accelerators** and should consequently not be measured in the same way: While Caireen innovation spaces seek to promote and support entrepreneurship, they strive to be open, accessible and inclusive rather than selective and focused on supporting already established start-ups with high-growth potential only. In fact, many of the users of innovation spaces in Cairo are currently not actually engaged in start-ups, but use the innovation spaces as freelancers, students or hobbyists. Apart from that, Caireen innovation spaces do not provide financial support or intensive mentorship, in the way that is common at start-up accelerators. Rather, Caireen spaces seem to function as **ecosystem-builders,** as suggested by Friederici (2014), as demonstrated in particular in the section on social capabilities.

In addition to that, as revealed in the second part of the analysis section, to a certain extent several of the innovation spaces in Cairo also hold a potential as **innovation-creators**. Since the roles of ecosystem-builders and innovation-creators were only alluded to in Friederici's report for *The World Bank* (2014), but not actually analyzed, little can be said here on the matter in how far the findings of this master's thesis indeed correspond to Friederici's (2014) experiences. However, this master's thesis may be seen as a first step to shedding light on these two roles which innovation spaces may fulfill.

Apart from that, the findings in this master's thesis, regarding the analyzed improvements in users' intellectual capabilities, are similar to the types of impacts on users' knowledge and skills sets[56], identified by Moraa (2013) in the context of the Cameroonian innovation space *ActivSpaces*. In addition to that, the subjective quantitative findings regarding users' capabilities and performance in their projects are comparable to some of the variables tested in *Deskmag's* (2012) global coworking survey. For the comparable variables, it can be said that the impacts identified on users' *social circle* and *business network* found in Cairo were roughly of the same magnitude as the worldwide average indicated by coworking space users. However, the magnitude of impacts on users' intellectual capabilities (comparable variables from the Deskmag study: *skill set*, *teamwork, creativity*, *ideas relating to business*), on users'

[56] For more information on this, please go back to page 23.

psychological capabilities (*self-confidence*), and project-/work-related performance (*productivity, income, company size*) was found to be stronger at innovation spaces in Cairo than Deskmag's (2012) averages regarding coworking spaces worldwide[57].

While Moraa (2013) only presents qualitative findings based on her own research, and Deskmag (2012) only presents quantitative findings, this master's thesis combined qualitative and quantitative approaches, to support hypothesis-building and -testing concerning the impact chains set into motion by innovation spaces. Above all, in contrast to the aforementioned approaches to impact evaluation of innovation spaces, this master's thesis suggests an **academic framework** for studying the impact of innovation spaces on their users and beyond. It identifies several academic concepts and theories from other fields of study, which appear applicable and relevant to the study of innovation spaces, and combines these in an innovative manner. One topic that is, to my knowledge, analyzed for the first time in this master's thesis, except for a brief mentioning of impacts on 'self-confidence' by both Moraa (2013) and Deskmag (2012), is the considerable role that innovation spaces play in enhancing the **psychological capabilities** of users. Amongst other things, this thesis highlights the importance that improved efficacy beliefs play in enhancing users' intellectual capabilities and their performance regarding innovating and being entrepreneurial.

In brief, I would thus say that the main **contribution of this master's thesis** is that it provides a fairly comprehensive overview of the different types of impacts that innovation spaces have on their users, and on indigenous innovation, as implemented by their users. Besides, in combination with part 1 of this study (the research report), this master's thesis (part 2) provides in-depth knowledge on ten innovation spaces in Cairo, their implementation and impacts, evaluated both qualitatively and quantitatively. This can be valuable for stakeholders in- or outside of Cairo, who wish to implement or improve innovation spaces of their own. Thus, this study seems of relevance both to practitioners and academics who wish to study the different types of impacts of innovation spaces more intensively.

Of course, due to the **exploratory nature** of this thesis, the findings as well as the academic framework suggested for studying the impact of innovation spaces are relatively tentative in character. Echoing both the opinions of many stakeholders, who are in the current phase to some extent "hyping" the innovation space format, and that of fellow researchers worldwide, most of whom are presently in the process of collecting data in this topic, I would say that more research is required to understand the working logic, impact and potential of the innovation space format.

Based on the exploratory findings presented in (part 1 and 2 of) this study, as well as on my knowledge of the issues innovation space founders/managers, users and

[57] To look at the global averages identified by Deskmag (2012) once again, please go back to tables 5 and 6 on page 24.

stakeholders are currently struggling with, I would **recommend** several topics and approaches for future research, which concern (a) studying the impact of innovation spaces on their users and beyond, but also (b) the implementation of the innovation space format. After all, there are a number of challenges with regards to the implementation that are shared not only among innovation spaces in Cairo, but also by many innovation spaces in other countries of the Global South. An overview of these challenges is presented in table 7. For a more elaborate discussion of these challenges, please read appendix 2, on pp. 94-103.

In general, **to strengthen the exploratory findings** of this master's thesis, it would make sense to analyze the impacts on the different capability categories in more depth. For example, it appears worthwhile to make use of an actual self-efficacy scale, e.g. following the guidelines of Bandura's (2006b) "guide for constructing self-efficacy scales", to determine innovation spaces' impacts on users' self-efficacy beliefs in an academically proven manner. As another example, it would make sense to apply a network-theory approach to studying the impact of innovation spaces on users' social capabilities. Besides, it may be of interest to conduct a similar study in a different setting, for instance, both in another country of the Global South or also one in the Global North, to better understand the locational contingencies, and which factors regarding the implementation, impacts and challenges are of particular importance where.

In terms of **research design**, I highly recommend including a qualitative element to any study of innovation spaces at the current stage. This can then be complemented by quantitative elements. Relying exclusively on quantitative elements risks not only to disregard the, at times large, differences in implementation of innovation spaces; it also risks to not sufficiently take into account the confounding effects which users experience, for example by moving around the "entrepreneurial ecosystem". After all, innovation space usage is far from a full-time occupation of users, and many users e.g. visit other entrepreneurship support organizations apart from their "home" innovation space. Apart from that, instead of one-shot interviews and participant observations, it would make sense to follow the developments at one or multiple innovation spaces during a longer period of time, as these innovative environments are highly keen on experimentation and change rapidly from within. Apart from that, they are forced to adapt quickly to changes in their environment. Also pretest-posttest designs are imaginable for studying the impacts of innovation spaces on users' social, intellectual and psychological capabilities in more depth. For instance, it would be imaginable to interview new users upon first-time arrival at innovation spaces and then again after several months of usage. This would contribute to a more accurate picture of the actual impacts of innovation spaces, which capabilities were already how strong at the beginning and in how far they really changed as a result of innovation space usage.

Table 7. The challenges of implementing innovation spaces (I.S.) in Cairo and an estimation of whether they are shared by other countries in the Global South and in the Global North		
Main challenges faced by I.S. in Cairo	**Shared by I.S. in the Global South?**	**Shared by I.S. in the Global North?**
Newness of the concept - Initially low awareness of the values/practices of I.S., which users are expected to contribute to - Clashes with established socio-cultural norms, regarding interaction between strangers & open-source idea	**No information** (Educated guess: Perhaps, but if so possibly in a different manner)	**No information** (Educated guess: Perhaps, but if so probably in a different manner)
Financial challenges - Irrespective of organizational and legal model	**Yes**, at least in many other African countries (Gathege & Moraa, 2013a)	Globally, on average innovation spaces break-even after **2 years** in operation (Foertsch, Becker, Cashman, Dullroy, & Striegler, 2012)
Challenges with regards to organization model - Full-time, half-time or volunteer engagement of staff? - Which role should "big players", like international development cooperation organizations, play?	**Yes**, at least in many other African countries (Gathege & Moraa, 2013a)	**No information** (Educated guess: Perhaps, and if so, probably in a similar manner)
Legal challenges - For for-profits: The Investment Ministry does not understand coworking concept, thus there is the risk that it demands I.S. to pay taxes for all users, who are perceived as "employees" - Hybrid for-profits do not exist - NGO law makes various parts of operation highly bureaucratic and difficult for NGOs - Tenancy law makes sub-renting difficult	**No information** (Educated guess: Perhaps, but if so probably in a different manner)	**No information** (Educated guess: Perhaps, but if so probably in a different manner)
Internet cutoffs, power outages	**Yes**, especially by many African countries (Gathege & Moraa, 2013a)	**No** (Educated guess)
Usage lows, at least but not limited to - Egyptian summers & Ramadan - Students' exam periods - Internet & power cuts - Protests & demonstrations	**No information** (Educated guess: Perhaps, but if so probably in a different manner)	**No information** (Educated guess: Perhaps, but if so probably in a different manner)

Finally, going beyond the topics explored in this study, I would recommend the following topics for future research on innovation spaces:

Recommendations for studying the impact of innovation spaces

- In how far do/can innovation spaces have a sustainable impact on innovation-creation and distribution?
- What is the role of innovation spaces as players in local, regional and trans-local innovation systems?
- What is the role of local[58] and trans-local[59] innovation space networks in innovation-creation and -distribution, in particular with regard to appropriate technologies?
- What is the role of global open-source networks in solving local problems, as exemplified by innovation space approaches?
- What is the role of return-migrants in the foundation, growth and success of innovation spaces in countries of the so-called Global South?
- What is the role of innovation spaces in building civil society?
- What is the role of innovation spaces in conflict areas?

Recommendations for studying the implementation of the innovation space format

- Which business models have the highest potential in guaranteeing long-term sustainability of innovation spaces in countries of the so-called Global South? Which contingencies are these business models dependent on?
- What would be an appropriate role for "big players", like development cooperation organizations and international businesses, in the establishment and growth of bottom-up innovation spaces? Should they play a role at all?
- Which methods are particularly effective for unleashing (a) positive psychological capabilities, (b) intellectual capabilities, and (c) social capabilities among innovation space users?
- How can hacker/maker solutions be harnessed and scaled more effectively?

[58] Such as *Coworking Egypt*
[59] Such as *AfriLabs*, the global *Impact Hub* network, the global *Fab Lab* network, the *ice-hub* network, and various hackerspace and makerspace networks

Appendices

1. Examples of projects and innovations devised at innovation spaces worldwide

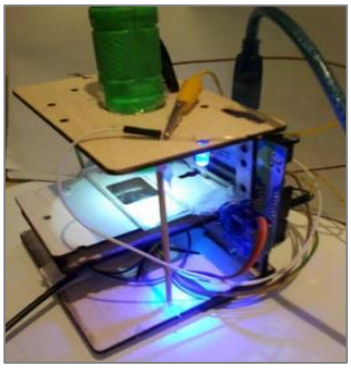
1.1 Example of a mobile for development application

The point of this example is to illustrate that software innovations for base of the pyramid customers are not only imaginable, but that they are intensively worked on at innovation spaces elsewhere in the world. For instance, at the *iHub* in Nairobi, Kenya, many innovation space users work on what is commonly refered to as 'mobile for development (M4D) applications (apps) that function on basic standard mobile phones. To provide an example of a well-known M4D app, *M-Farm* works as a transparency tool for farmers, by providing them with accurate, real-time information on the market price of their products, to put them in a better position for negotiating prices with manufacturers and for finding buyers (see figure 18) (Colaço, 2012).

Figure 18. M-Farm application[60]

1.2 Examples of appropriate (hardware) technology innovations, devised at other innovation spaces in Egypt and around the world

Fig. 19. icealex' DIY microscope[61]



Apart from the laser cutter, *icealex* is also pioneering the innovation of other appropriate technologies, such as a DIY microscope (see figure 19) and conductive ink – both of which were amongst others used to educate Egyptian students about technology and electronics –, and an air quality monitoring station, invented to raise awareness and find solutions to the severe problem of air pollution in Egypt (Ahmed Bastawy, in Agrivina et al., 2014).

[60] Source : http://martinpasquier.com/2013/11/30/real-time-stock-price-for-african-farmers-a-case-study-of-connected-agriculture-with-m-farm-in-kenya/
[61] Source: http://icealex.com/

Fig. 20 Functional set of fingers, at US $5, invented in Johannesburg[62]

Further interesting examples of appropriate technologies developed at different innovation spaces around the world include, in the field of health, very low-cost DIY prosthetics, developed for instance at innovation spaces in Indonesia, the USA and South Africa (see figure 20) (Agrivina & Kovats, 2014; Ghalib, 2014). At a hackerspace in Baghdad, a hacker father whose son got cancer from uranium worked on a Geiger counter that incorporates a GPS caster, to track radiation and cancer, in cooperation with a center for cancer research. The original Geiger counter had been invented as a DIY project at a hackerspace in Tokyo, to track radiation after the nuclear disaster following the tsunami of 2011 (Ghalib, 2014).

Fig. 21 Nubialin cantenna[63]

Internet connectivity devices are another type of appropriate technologies worked on in places with low or disruptive technologies. At the *ice*-affiliated project *Nubialin* in Aswan, Upper Egypt, in the context of a maker festival, hackers built a 'cantenna', i.e. a DIY directional waveguide antenna made from an open-ended can to make use of the nearest internet signal at a distance of 16km, on a disconnected island on the Nile (see fig. 21) (Zimmerman, 2014). On the other end of the spectrum stands the *iHub*-affiliated *BRCK*, an internet connectivity device that promises to be portable, robust, SIM card-based, allows sharing the connection with 20 devices simultaneously, continue to work for further 8 hours in the case of electricity fallouts and allow for further DIY customization by end-users, which is now sold by a Kenyan start-up of the same name (Gitau, 2014).

1.3 Examples of activist efforts from other Arab countries

Similar to the anti-harassment initiative *HarassMap* in Egypt, at an innovation space in Beirut, Lebanon, the *Ushahidi* software was used to raise awareness of the issue of homelessness. After a homeless person suddenly disappeared and was later found dead, the software was used to track him and others, and make sure that they stop disappearing. The same Lebanese space also started the social media campaign *I am not a martyr*, which commemorates victims of violence and protests the idea of martyrdom (Ghalib, 2014).

[62] Source: (Coward & Wijeweera, 2013b)
[63] Source: http://icehubs.wordpress.com/2014/04/09/nubialin-internet/

2. Challenges faced by Innovation Spaces in Cairo

When talking to innovation space founders/managers, it quickly became apparent that they essentially all deal with a similar set of challenges when founding and operating in the Caireen/Egyptian context. As a continuation of these challenges in the long run limits the impact that innovation spaces can have on their users and surroundings, it seems relevant to scrutinize what these challenges are, to as a second step open a discussion of how they could be resolved.

2.1 Newness of the concept

The main challenge noted by most innovation space founders/managers in operating their innovation space was the newness of the concept, and to a certain extent the affiliated clash this concept presents with regards to established socio-cultural norms in Egypt. What is implied by this challenge is on the one hand, that by the middle of 2013, when fieldwork was conducted, few people in Egypt knew about innovation spaces, and founders/managers had a hard time explaining what using the space entails. Especially in the case of coworking spaces, at the beginning many users confused the concept with office renting facilities and were under the impression that they should get their own keys to their own office and could refrain from interacting with other users. Similarly, in the case of hacker-/makerspaces, at the beginning, many people came only to use the machinery, thinking that the hacker-/makerspaces were companies that provided machinery. Therefore, they did not interact much with other users, did not make use of the networking opportunities, and affiliated pool of intellectual capabilities and enthusiasm. To illustrate the type of challenge, founders/managers are struggling with, consider the following statement, which was added by the founder of *The District* after pointing out that "communicating what it is that we're doing" was and still is the biggest challenge the coworking space faces,

> "I guess that the people who master the concepts that we want, we want people to start practicing. To practice the power of collaboration, because so many people are meeting and saying, 'yeah, but if I come here and start sharing, they might steal my idea' – and this type of thing – 'If I am sharing, what are you offering to me?' But it's not like this. From what is the concept, we are not offering you something, but it's the community that is offering you something. It's the whole concept of gift-economy that we are being open and transparent and collaborate with others. Just like practicing serendipity – you don't know what's happening. But we have some coworkers and after two or three, six months, one year, they are starting to work together more, work with other coworkers, exchanging ideas, making business deals, whatever. So actually, what the concept was is still one of the biggest challenges." (Cofounder of The District, in "Focus group interview with 1 founder and 1 manager/user of The District," 2013)

While this quote on the one hand shows that, at least at the beginning, many users who

joined the innovation spaces were skeptical about the premise of being open about sharing ideas and resources. And while there was nobody who provided an example and acted as a role model, it was difficult to change people's individual behavior. After all, as has been explained in the analysis section, the values/practices promoted at innovation spaces go against established socio-cultural norms to a certain extent.

However, the quote also points out that as the innovation space communities are growing and new users observe already present others practicing the innovation space values that are preached by the founders/managers as well as the growing affiliated communities, new users are much more easily convinced to adapt:

> "That is something I learned myself: the community behavior change is very much easier than individual behavior change. When you are part of a community and you see everyone open, it's like, 'hey, maybe it's not as bad as expected'. So many of our coworkers were like when they were joining at the beginning they thought, 'okay, it's nice place and it's close to my house. It's just a physical space'. But then, when they started coworking, they realized that there is different value added that they didn't expect. So it's really about experiencing it." (Cofounder of The District, in "Focus group interview with 1 founder and 1 manager/user of The District," 2013)

In an interview with the founder of the oldest innovation space still that still operates today, the founder pointed out that the acceptance of this new concept had already improved considerably since the early days of *Rasheed22*. She attributed this improvement to large extents to the revolution of 2011, which to a great extent, brought people, previously unfamiliar with each other, together and fight for a common cause ("Interview with Rasheed22 founder," 2013). Almost one further year later, after the fieldwork was conducted, one of the managers of *icecairo* pointed out at *Re:publica 2014*, that the acceptance of the concept had increased considerably in the previous year, that the innovation space communities were growing at a fast pace, by way that the different Caireen innovation spaces essentially worked together to increase awareness of their existence and purpose in a solidary manner (Radwan, 2014).

2.2 Legal challenges

The second challenge faced by all innovation spaces in Cairo concerns the prevailing legal system in Egypt. All founders lamented that there is no appropriate legal framework for the foundation of innovation spaces.

Those innovation spaces which wish to operate as not-for-profit entities find that Egyptian **NGO Law** makes their lives very difficult ("Interview with Beit el Raseef cofounder/user," 2013, "Interview with Fab Lab Egypt cofounder/user," 2013, "Interview with Mesaha cofounder," 2013). For one thing, it is difficult to register an NGO. The founder of Mesaha remembers,

> "I spent 8 months to get a registration. I've been stuck in the step for getting a bank account. I go to the bank with a letter of authority from the Ministry of Social Affairs, asking them to open a bank account for my institution, to complete the paperwork for my registration. The bank refused. And I go back to the authority at the Ministry of Social Affairs and they tell me, you should get this paper before we give you the registration." ("Interview with Mesaha cofounder," 2013)

Besides, once registration is granted, NGOs are monitored closely by the *Ministry of Social Affairs*. Apart from being required to send in at least 4 board meeting reports per year, they are also not allowed to receive funding from abroad or spend money as they wish, without a specific permission from this ministry. The problem with this is that such permissions can take six months or longer and NGOs typically cannot wait that long for donations or funds ("Interview with Fab Lab Egypt cofounder/user," 2013, "Interview with Mesaha cofounder," 2013). During the time of fieldwork, the situation was particularly precarious for NGOs, due to the Egyptian court's decision to force the closure of a number of foreign NGOs and give jail sentences to 43 non-profit workers, for supposedly "intruding in the country's internal affairs", by allegedly promoting unrest during the months following the 2011 revolution. As a consequence, a multitude of Egyptian NGOs stopped receiving money from foreign NGOs, "which were always the backbone of Egypt's civil society" (Kaufmann, 2013).

While registration as a normal **for-profit company** results in less stress and troubles with Egyptian bureaucracies, it is not a straightforward matter either. Most of the coworking spaces tried this approach; however "coworking" is not available as a registration category with the *Investment Ministry*. As a result, the founders were forced to resort to different, existing categories. For instance, *The District* registered as "business consultants" providing services to another company, while *302 Labs* decided to register as a "software company", pretending to provide trainings to the people who may be present in the event of a random check from the Egyptian authorities. *The District* founder had experienced these types of visits already. As the authority representatives typically do not understand the concept of coworking, they believe that all people present at a certain space must be employees and thus request the managers to pay taxes for these employees ("Interview with 302Labs cofounder," 2013, "Interview with Rasheed22 founder," 2013, "Interview with the founder and one manager of The District," 2013).

Several innovation spaces, namely *Rasheed22* and *icecairo*, would actually prefer to register as **hybrid not-for-profit social businesses**, which would be able to generate income, but invest the generated income into their social mission. However, the Egyptian law does not provide any possibilities for this either. So in the end, the majority of studied innovation spaces ended up registering as for-profit businesses, to avoid state bureaucracies surrounding NGOs. Those Caireen innovation spaces that did register as NGOs are actually considering switching towards a for-profit status as well.

Tenancy Law constitutes another restraining structure impacting on innovation spaces: It would be beneficial for many innovation spaces, and in particular coworking spaces, if they could provide subletting contracts to their coworkers. The rationale is that many coworking start-up entrepreneurs or freelancers would like to register their business at these spaces; however, this is only possible with a rental contract. The issue is that Tenancy Law is organized in such a way in Egypt that an approval is always required from the side of landlords/landladies and these refrain from giving approvals, because overall the law tends to be on the side of the renters. Thus landlords/landladies fear not to be able to get rid of sub-renters, when agreeing to sub-rental contracts ("Interview with Rasheed22 founder," 2013).

2.3 Financial challenges

As partly already mentioned in Stercken (2014), at the time of fieldwork, all Caireen innovation spaces were struggling with financial challenges. *The District* and *Almaqarr* were the only Caireen innovation spaces which managed to break-even with the operational costs in several months, in others, they still failed to do so("Focus group interview with 1 founder and 1 manager/user of The District," 2013, "Interview with Almaqarr cofounder," 2013). Several of the interviewed founders/managers of these spaces pointed out that coworking, hacking or making was different in Egypt than elsewhere, so transferring the same business models did not work:

> "one of the lessons, if you start reading about such communities, such spaces, as they have already started in Europe and the US, you cannot establish the space in the same way in Egypt or the Middle East, I would say. […] In order to bring more people, we need to have more free activities and workshops. […] We would like to bring in more students, because cost is a very important factor, so it needs to be cheap as much as possible. One of the other things, it's a new activity and a new idea, before starting with promoting for activities, you help people understand what it's all about and what they can do. How they can benefit from such activities, in their own lives, in their day-to-day activities." ("Interview with Fab Lab Egypt cofounder/user," 2013)

> "I'd say that Europe is an expensive place. US is an expensive place. To go out to a café is expensive. To go out in general, there is a cost. Especially if you're an entrepreneur and you need every cent in your investment. Whereas here in Egypt there is a lot of alternatives and they are not very costly. I wouldn't say they are as good as coworking spaces – that is why I still like the idea and I think it is fine in Cairo. But it is my understanding that no one is doing really well in coworking as a business, if they're not doing anything else. […] It's not making money in the long term." ("Interview with icecairo manager 1," 2013)

However, it is also worth drawing attention to the fact that the majority of the Caireen innovation spaces are still very young, and even internationally, including in countries like Germany or the USA, coworking spaces usually only start breaking even after two years in operation (Foertsch et al., 2012).

The innovation spaces in Cairo make use of a variety of business models, to cover their operating expenses and/or attempt to make a financial profit. Half of the coworking spaces charge the typical hourly/daily/monthly rates for coworking and/or for usage of meeting rooms. At the same time, prices are negotiable according to users' ability to pay, and the degree of formality with which price lists are followed varies. Besides, the majority of spaces combine this general model of paying in cash with the possibility of specific regulations for people who lack the financial means or want to pay in a different kind of currency. Options include offering to work as volunteers, donating in kind, writing news articles on the space or marketing it through social media channels, taking pictures at events etc. Two coworking spaces, i.e. *Qafeer Labs* and *The District* actually try to implement a business model, based on that of *Seats2Meet,* where coworking is for free (everywhere in the case of *Qafeer Labs* and in one of two apartments at *The District*). However, money is still charged for the usage of meeting rooms, and the spaces can hope to benefit from an improved reputation as a result from providing coworking space for free.

In the case of *Cairo Hackerspace* and *Fab Lab Egypt*, a monthly membership fee is charged. Besides, they charge for the usage of machines and for participation in certain events. Like many of the coworking spaces, both of these innovation spaces also allow for paying in alternative currencies than cash. For the spaces that are mainly used for meetings and events, i.e. *Mesaha*, *Almaqarr* and *Beit ElRaseef*, renting out meeting space constitutes the main income for the former two, while the entrance fee to weekly music parties and workshops constitutes the main income stream to *Beit ElRaseef*. In particular *Mesaha* and *Beit ElRaseef* make sure to include people who cannot pay for these services, by providing scholarships, when necessary. Besides, all of the innovation spaces referred to in this paragraph, except for *Almaqarr*, are run exclusively by volunteers. This obviously lowers the running costs and thus the revenue that needs to be generated to cover these costs.

Finally, *icecairo*, at the time of fieldwork, did not have a fully-fledged business model of its own yet. At the beginning of the fieldwork, the idea was to mainly generate money through renting out events space, and alongside charging a little for coworking and usage of the fab lab. Later on, they decided that coworking should remain for free, so that it would be open to everyone. Yet, they recognized the necessity of finding different income streams instead, and were planning to rapidly prototype a couple, including the development of green products in house, trainings of trainers and an induction program. Besides, a more conventional idea included CSR funding by a large corporation. Compared to the other innovation spaces, *icecairo* could be said to be in a luxurious position, as they were supported by the *large development cooperation organization* in the first two years. Yet, they were already worried about the time that funding would end and they would be forced to cover rent etc. themselves.

2.4 Challenges related to different organizational models

Depending on the organizational models, which the different innovation spaces made use of, they faced varying challenges. Four of the innovation spaces, namely *The District*, *icecairo*, *Qafeer Labs* and to some extent *Almaqarr*, are run by dedicated founders-managers. Two of the other innovation spaces, that is *Rasheed22* and *302 Labs*, were run by the founders, however these were not fully dedicated to operating their respective coworking spaces, because they primarily held other jobs and basically ran the innovation spaces on the side – in the case of *Rasheed22*, with the additional help of other users/volunteers. The remaining four innovation spaces, i.e. *Beit ElRaseef*, *Cairo Hackerspace*, *Fab Lab Egypt* and *Mesaha,* primarily depend on volunteers for completing organizational tasks – of which several but not all are also the original founders. These different organizational models entail positive as well as negative sides.

On the one hand, **volunteering** of users seems to boost community-involvement and can result in a deep dedication to and identification with the innovation space. Besides, it helps to keeps the costs low, and thereby facilitates access for people who would otherwise perhaps not have the financial means to access the space. Yet, volunteering also has its trade-offs. As people usually only volunteer on the side, they usually only have limited time, organizational knowledge and commitment to offer to the innovation space. As the interviewed cofounder of Beit ElRaseef put it,

> "We learn by doing. So we do a lot of mistakes. We are very new in the business things. So actually we do a lot of mistakes, like not dividing the tasks in a good way. We have no very professional managerial skills; we like to be more experimental, more ourselves. When you do business and you are yourself, things come up. Some tasks are dropped and have to be covered at the end, when it's too late to be covered. And sometimes it's, like I said, when money comes in the equation, it gets a little harder. We have to cover our rent. We have to get paid workshops. We have to do better advertising about our parties, our music nights, to cover that rent and keep the place running. That's when things are becoming a little more personal, like 'okay, that's your task and you're not doing it. That's a problem'. And you have to cover things up and that's when we started to do some meetings, 'okay, we can't be ourselves that much anymore. We have to do some management'. And actually, everyone, every time, we fail to do this, because we like being ourselves. So we manage it a little, and things come back to its old life." ("Interview with Beit ElRaseef cofounder/user," 2013)

Similar issues to those of *Beit ElRaseef* were brought up by the interviewed cofounder of *Mesaha*. Nevertheless, both of these innovation spaces managed to reach out to a tremendous number of people and build awareness, presumably due to the large number of well-connected cofounders, volunteers and enthusiastic users, who were quick to invite their friends and networks to the innovation space.

In contrast to this, *Cairo Hackerspace* was much less effective at awareness-raising and marketing. At the time the fieldwork was conducted, the group of users

essentially consisted of only ten people who were friends or friends of friends, not because they were not open to others or did not want others to join. In fact, the interviewed cofounder lamented the fact that they did not manage to attract more people, and at the height of *Cairo Hackerspace*'s activity, when conducting a 10-day pop-up hackerspace hackathon at the Caireen community center *Townhouse*, large numbers of people showed interest and participated enthusiastically. However, as *Cairo Hackerspace* during long periods of its existence did not have a permanent physical space and its members dedicated little effort to keeping the affiliated network updated, the number of users was fairly low at the time of fieldwork.

In contrast to the other volunteer-run innovation spaces, *Fab Lab Egypt* had fewer problems with organizational matters, as several of them had received training courses on how to run a fab lab, through the *MIT Global Fab Lab* network in addition to a one-month-incubation program from the renowned Caireen business incubator *Flat6Labs* in the aftermath of winning the third prize in the *NEGMA*[64] competition. Yet, *Fab Lab Egypt* was not as successful in its marketing as the volunteer-run events/meeting spaces *Beit ElRaseef* or *Mesaha*.

On the other hand, in contrast to the volunteers, the **fully-dedicated founders-managers** of *The District*, *icecairo*, *Qafeer Labs* and *Almaqarr* could unsurprisingly spend much more time and effort on organizational matters, such as community management, marketing, linking up with other innovation spaces and entrepreneurship support organizations throughout Egypt. Indeed, they seemingly had a much better organizational overview than the four aforementioned spaces. At the same time, these founders-managers also had more pressure to make money through their innovation spaces, as their income depended on these spaces; and to some extent they were forced to pass on the resulting higher costs of operation to their users – although they had not necessarily found a way of how to do so yet, as discussed in the previous section. The case of *icecairo* is a little bit particular in this regard, because the managers were in the advantageous position of having their salaries paid by the *large development cooperation organization* in the first two years of operation. The other founders/managers had to stand on their own feet from the beginning.

Finally, the two innovation spaces – *Rasheed22* and *302 Labs* – which had what could be called **part-time space managers** somehow seemed to stand between these two worlds. On the one side, they seemed to have fewer organizational difficulties in terms of task-distributions and volunteer-management than the aforementioned volunteer-run organizations. On the other side, the dedication of effort and resources from the side of the founders-managers was obviously lower than that of the fully-

[64] NEGMA is a NGO started in the aftermath of the 2011 revolution by a number of Egyptian-American professionals from Harvard University and the Massachusetts Institute of Technology, in order to promote "entrepreneurship for development".

dedicated ones. Thus, at the time of fieldwork, neither of them was able to organize community-building events, or spend too many resources on marketing for new users. At the same time, they also did not have a large pool of volunteers like *Beit ElRaseef*, *Mesaha* or *Fab Lab Egypt*, which were despite the lack of dedicated managers, able to offer events, as a result of the collaborative efforts of volunteers.

To some extent, it seems as though these differences in organizational models also show in the innovation spaces' diverging numbers of users affiliated, and in the considerable differences between the growth of these numbers. Those spaces with fully-dedicated managers as well as those coordinated by a large number of volunteers appear to be growing much faster than the ones led by part-time managers or lower numbers of volunteers.

As a last point on organizational models, I would like to address the pros and cons of taking **large external institutions**, be it donors, companies or governmental organizations on board. Among the innovation spaces analyzed, *icecairo* had by far the largest amount of support by such a big actor, and it can be said that it both benefited and suffered from this support: Of course, the two-year support in terms of paying salaries to three managers, paying rent, renovation works and expensive machinery can be seen as a way of putting *icecairo* in a luxurious position as compared to the other Caireen innovation spaces. However, at times, it seemed as though this blessing developed into a burden, when the *large development cooperation organization*, with its bureaucratic structures caused big delays in decision-making and payment – which led to considerable delays in renovating the physical space, building the community, equipping the fab lab etc. – issues which the other Caireen innovation spaces did not have to deal with. Apart from that, from the beginning, *icecairo* was presented under the banner of the *large development cooperation organization*, first as a training series and later including the physical space. As a consequence, the initiative was largely organized in a top-down manner, and by the time the three Egyptian managers were brought in, to root the community from the bottom up, to some extent, it already seemed too late for that,

> "This is not a space set up by the community. Even the design is done by one guy. At one point we did try to get the community involved. We put the tables out, and they could write on it what they wanted in the space and then people thought we had [the large development cooperation organization] behind us and they were like 'oooh, we think we should get the nicest desks, chairs and the biggest computers' – and I don't know what. […] Once they hear that you're funded, then it's no longer a community project. So, this is the challenge. […] If it had been the community established it first and then looking for support […], it's a totally different story. But this was labeled as a […] project [by the large development cooperation organization] from the beginning. So what people saw was just cash." ("Interview with icecairo manager 3," 2013)

In this quote, users' dedication and sense of identification with *icecairo* is presented as considerably lower due to the involvement of the *large development cooperation organization*, than would otherwise be the case, not least because "people just saw cash". This makes it more difficult for *icecairo* than for the other Caireen innovation spaces to promote the essential innovation space value of 'community' – as there is always a sense of external control. Users cannot simply decide to do this or do that. What makes it worse, is that *icecairo* is not only struggling with the bureaucracy of the *large development cooperation organization*, but also that of an NGO which incubates *icecairo*, and that of the Egyptian government. The Egyptian government has a stake in all NGOs in Egypt, and in all organizations which receive funding from abroad. As a consequence, the Egyptian government has the power to grant or block e.g. purchases of machinery.

In the light of these complications, it becomes clear why three of the volunteer-run organizations, i.e. *Cairo Hackerspace*, *Mesaha* and *Beit ElRaseef* fiercely reject the idea of working together with any external stakeholders who might exert control over their community projects, be it investors, development organizations or NGOs (Stercken, 2014). While *Fab Lab Egypt* works together with some external stakeholders, in particular through the involvement of the MIT-affiliated *Global Fab Lab* network as well as a philanthropic investor, who pays for its rent, it is selective about who it would work together with and who it would trust in setting up an innovation space of its own. For instance, the interviewed Fab Lab Egypt cofounder/user told me, that he would feel "not very comfortable" if the government or businesses managed maker spaces, "In my opinion, to make such an impact and to make the people feel at home and that they can do anything they want, it needs to be a grassroots thing." ("Interview with Fab Lab Egypt cofounder/user," 2013).

While the innovation spaces run as businesses, with dedicated or part-time managers, appeared to be more open to the involvement of external stakeholders than the volunteer-run ones, they were still highly concerned about maintaining the bottom-up community character of their innovation spaces. In this respect, they saw some advantages in the lack of external involvement.

2.5 Lows in internet connection, power and usage

In section 7.1.1, it has already been pointed out that the cost and speed of internet, as well as frequently-occurring electricity and internet cuts, are challenges for Egyptian knowledge-workers. In that section, it was also mentioned that innovation spaces can function as gap-builders, as they have the capacity to provide a better internet connection; some even provide multiple internet connections from multiple providers;

and one space actually provides a personal electricity generator, for the occurrence of power cuts.

However, these different technologies obviously entail a cost, and it is clearly not of benefit to innovation spaces' overall financial balance when exorbitant amounts of money are spent on internet connections. Besides, the aforementioned gap-building only functions up to a certain extent. When electricity or internet fallouts occur nevertheless, users tend to simply go home, leading to usage lows, which result in income lows for innovation spaces. Many of these fallouts occur in Egyptian summer, when the broad usage of air-conditionings overwhelms the Egyptian power infrastructure. As also other usage lows occur, due to amongst others demonstrations, the tremendous heat of Egyptian summer, Ramadan, exam period and holidays[65], it becomes apparent why further (often unexpected) usage lows due to internet and power fallouts are problematic for innovation spaces. In comparison, the event/meeting spaces (as well as to some extent the hacker/makerspaces) seem to be able to cope with internet and power cuts a bit better, because many events, meetings or trainings can also be conducted without internet or in the daylight. The coworking spaces suffer most, because virtually all coworkers are dependent on the internet for their work.

[65] Both of which result in fewer student organization meetings

Bibliography

1st Results of the 3rd Global Coworking Survey. (2012). *Deskmag*. Retrieved May 02, 2013, from http://www.deskmag.com/en/1st-results-of-the-3rd-global-coworking-survey-2012

A History of Coworking in a Timeline. (2014). *Deskmag - The Coworking Magazine*. Retrieved January 10, 2014, from http://www.tiki-toki.com/timeline/entry/156192/The-History-Of-Coworking-Presented-By-Deskmag#vars!date=2014-02-02_06:51:25!

About Us. (2014). *AfriHive*. Retrieved May 14, 2014, from http://afrihive.com/

Agrivina, I., Agustini, G., Bastawy, A., & Druga, S. (2014). Critical Making in Africa: Local Manufacturing and Regional Collaboration. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/197/talks/346

Agrivina, I., & Kovats, S. (2014). YOGYA2015 Summit of Critical Making @ HONF. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/440

Akinyemi, T., Fajardo, J., Gutierrez, P., & Knight, D. (2014). From Silicon Alley to Silicon Savannah. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/839

Alkire, S. (2005a). Why the Capability Approach? *Journal of Human Development*, *6*(1), 115–135. doi:10.1080/146498805200034275

Alkire, S. (2005b). Subjective Quantitative Studies of Human Agency. *Social Indicators Research*, *74*(1), 217–260. doi:10.1007/s11205-005-6525-0

Alkire, S. (2005c). Measuring the freedom aspects of capabilities, 1–23.

Aregbesola, R. (2014). 2014 LSE Africa Summit: African Tech Hubs - A tale of hope or hype? *London School of Economics and Political Science*. Retrieved May 26, 2014, from http://blogs.lse.ac.uk/africaatlse/2014/03/05/2014-lse-africa-summit-africa-tech-hubs-a-tale-of-hope-or-hype/

Audette-Chapdelaine, V. (2011). Espaces émergents, nouvelles pratiques et bibliothèques publiques. In *Conférence-midi*. Montreal: Ecole de bibliothéconomie et des sciences de l'information. Retrieved from http://www.slideshare.net/vincentac?utm_campaign=profiletracking&utm_medium=sssite&utm_source=ssslideview

Bandura, A. (1971). *Social Learning Theory*. New York City: General Learning Press.

Bandura, A. (1995). Exercise of personal and collective efficacy in changing societies. In A. Bandura (Ed.), *Self-Efficacy in Changing Societies* (Online Edi.). Cambridge, New

York, Melbourne, Madrid, Cape Town, Singapore, Sao Paolo, Delhi: Cambridge University Press.

Bandura, A. (1997). *Self-efficacy: The Exercise of Control*. New York: Freeman.

Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annual Review of Psychology*, *52*, 1–26.

Bandura, A. (2006a). Toward a Psychology of Human Agency. *Perspectives on Psychological Science*, *1*(2), 164–180. doi:10.1111/j.1745-6916.2006.00011.x

Bandura, A. (2006b). Guide for constructing self-efficacy scales. In F. Pajares & T. Urdan (Eds.), *Self-Efficacy Beliefs of Adolescents*. Information Age Publishing.

Barsoum, M. (2014). Campaign to improve internet speeds in Egypt. *english.ahram.org.eg*. Retrieved August 28, 2014, from http://english.ahram.org.eg/NewsContent/1/151/95648/Egypt/Features/Campaign-to-improve-internet-speeds-in-Egypt.aspx

Betahaus - ein coworking Handbuch. (n.d.).

Boone, H. N., & Boone, D. A. (2012). Analyzing Likert Data. *Journal of Extension*, *50*(2).

Castells, M. (2010). *The rise of the network society: The information age: Economy, society, and culture* (2nd ed., Vol. I). Chichester; Malden; Oxford: Wiley-Blackwell.

Colaço, J. (2012). Mfarm & Samsung launch M-Farm mobile application. *www.ihub.co.ke*. Retrieved November 10, 2013, from http://www.ihub.co.ke/blog/2012/06/mfarm-samsung-launch-m-farm-mobile-application/

Coward, C., & Wijeweera, D. (2013a). Espacios de innovacion - Del acceso a la información al acceso a otras personas. Bogota: Banco de la Républica. Retrieved from http://www.youtube.com/watch?v=u_-gP0HTK7s&feature=c4-overview&list=UUhZOxqPLDYCVgU9bvOm4QBQ

Coward, C., & Wijeweera, D. (2013b). From Access to Information to Access to Each Other - Public Libraries as Innovation Spaces? Pretoria: Technology & Social Change Group.

coworking wiki - our values. (n.d.). Retrieved April 02, 2013, from http://wiki.coworking.com/w/page/16583831/FrontPage#OurValues

De Koning, A. (2005). *Global dreams: space, class and gender in middle class Cairo*.

DeGuzman, G., Tang, A., & McKeller, C. (2011). *Working in the Unoffice: A Guide to Coworking for Indie Workers, Small Businesses, and Nonprofits (Google eBook)*. Night

Owls Press LLC. Retrieved from http://books.google.com/books?hl=en&lr=&id=24GaZrwmaHUC&pgis=1

Deskmag. (2012). *First results of The 3rd Global Coworking Survey*. Retrieved from http://de.slideshare.net/deskwanted/global-coworking-survey-2012?ref=http://blog.deskwanted.com/

Dew, N. (2009). Serendipity in Entrepreneurship. *Organization Studies*, *30*(7), 735–753. doi:10.1177/0170840609104815

Drzeniek Hanouz, M., & Dusek, M. (2013). *The Arab World Competitiveness Report 2013*. Geneva.

Egypt - Population. (n.d.). *Indexmundi*. Retrieved February 04, 2014, from http://www.indexmundi.com/facts/egypt/population

Ehmke, T., Bastawy, A., & Lange, B. (2014). Maker Culture vs. Industrial Innovation Strategies? Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/378

El-Sadek, F. S. (2011). *The Streets of Cairo and the Battle for Public Space*. University of Cambridge.

El-Sharnouby, D. (2012). *Youth and the 25th Revolution in Egypt : Agents of Change and its Multiple Meanings*. American University in Cairo.

Field, A. (2009). *Discovering Statistics Using SPSS* (3rd ed.). Los Angeles, London, New Delhi, Singapore, Washington D.C.: SAGE.

Focus group interview with 1 founder and 1 manager/user of The District. (2013). Cairo.

Focus group interview with 2 users of the coworking space The District. (2013). Cairo.

Foertsch, C. (2013). 4.5 New Coworking Spaces Per Work Day. *Deskmag - The Coworking Magazine*. Retrieved February 05, 2014, from http://www.deskmag.com/en/2500-coworking-spaces-4-5-per-day-741

Foertsch, C., Becker, J., Cashman, A., Dullroy, J., & Striegler, P. (2012). *2nd Annual Global Coworking Survey*. Berlin.

Friederici, N. (2014). How Do We Know that Tech Hubs Make A Difference? A Crash Course on Evaluation in Innovation Ecosystems. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/393

Fu, X., Pietrobelli, C., & Soete, L. (2011). The Role of Foreign Technology and Indigenous Innovation in the Emerging Economies : Technological Change and Catching-up. *World Development*, *39*(7), 1204–1212. doi:10.1016/j.worlddev.2010.05.009

Gathege, D., & Moraa, H. (2013a). Draft Report On Comparative Study On Innovation Hubs Across Africa, (May).

Gathege, D., & Moraa, H. (2013b). ICT Hubs model : Understanding Factors that make up the MEST ICT Hub - ACCRA , Ghana, (April).

Ghalib, B. (2014). Take a Deep Breath Before Making. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/360

Gitau, M. (2014). Building World Class Talent in the African Tech Community. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/300

Hackidemia. (2014). Retrieved August 03, 2014, from http://www.hackidemia.com/mission/

International Telecommunication Union. (2013). Percentage of Individuals using the Internet 2000-2012. *www.itu.int/*. Retrieved August 30, 2014, from http://www.itu.int/net/itu_search/index.aspx?cx=001276825495132238663:nqzm45z846q&cof=FORID:9&ie=UTF-8&q=internet+penetration+egypt

Interview with 302 Labs cofounder/user. (2013). Cairo.

Interview with a user of different coworking spaces. (2013). Cairo.

Interview with Almaqarr cofounder. (2013). Cairo.

Interview with Beit el Raseef cofounder/user. (2013). Cairo.

Interview with Cairo Hackerspace cofounder/user. (2013). Cairo.

Interview with Christine Prefontaine, 10 February 2014. (n.d.).

Interview with Fab Lab Egypt cofounder/user. (2013). Cairo.

Interview with icecairo manager 1. (2013). Cairo.

Interview with icecairo manager 2. (2013). Cairo.

Interview with icecairo manager 3. (2013). Cairo.

Interview with Mesaha cofounder. (2013). Cairo.

Interview with Qafeer cofounder. (2013). Cairo.

Interview with Rasheed22 founder. (2013). Cairo.

Interview with the entrepreneurship consultant Hayk Hakobyan. (2013). Cairo.

Interview with the entrepreneurship researcher Prof. Hala Hattab. (2013). Cairo.

Interview with user of event/meeting space Beit el Raseef. (2013). Cairo.

Interview with user of the coworking space Rasheed22. (2013). Cairo.

Interview with user of the event/meenting space Beit el Raseef. (2013). Cairo.

Interview with user of the event/meeting space Mesaha. (2013). Cairo.

Interview with user of the hacker-/makerspace icecairo. (2013). Cairo.

Johns, T., & Gratton, L. (2013). The third wave of virtual work. *Harvard Business Review*, (January-February), 66–73.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher*, *33*(14). doi:10.3102/0013189X033007014

Kaufmann, D. (2013, June 4). Foreign NGOs must close in Egypt, court rules. *Deutsche Welle*. Cairo. Retrieved from http://www.dw.de/foreign-ngos-must-close-in-egypt-court-rules/a-16856835

Kingdon, M. (2012). *The Science of Serendipity: How to Unlock the Promise of Innovation in Large Organisations*. John Wiley & Sons Ltd. Retrieved from http://books.google.nl/books?hl=en&lr=&id=GFWnPVg0PbAC&oi=fnd&pg=PR7&dq=matt+kingdon+the+science+of+serendipity&ots=9WdMazqkFI&sig=u2p5V7eSQ1oI5D7wEDo1UagKtCQ&redir_esc=y#v=onepage&q=matt kingdon the science of serendipity&f=true

Kingsley, P. (2014). Does a growing global youth population fuel politifcal unrest? *The Guardian*. Retrieved September 13, 2014, from http://www.theguardian.com/world/2014/mar/19/growing-youth-population-fuel-political-unrest-middle-east-south-america

Kreisler, H. (2001). Identity and Change in the Network Society - Conversation with Manuel Castells. *Conversations with History; Institute of International Studies, UC Berkeley*. Retrieved April 02, 2014, from http://globetrotter.berkeley.edu/people/Castells/castells-con0.html

Labs. (2013). *AfriLabs*. Retrieved May 07, 2013, from http://afrilabs.com/labs/

List of Hacker Spaces. (2014). *www.hackerspaces.org*. Retrieved from http://hackerspaces.org/wiki/List_of_Hacker_Spaces

Luthans, F., Luthans, K. W., & Luthans, B. C. (2004). Positive psychological capital : Beyond human and social capital. *Business Horizons*, *47*(1), 45–50.

Luthans, F., & Youssef, C. M. (2004). Human, Social, and Now Positive Psychological Capital Management: *Organizational Dynamics*, *33*(2), 143–160. doi:10.1016/j.orgdyn.2004.01.003

Manske, J. (2014). Loise and the African Dream. Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/358

Merton, R. K., & Barber, E. (2004). *The Travels and Adventures of Serendipity: A Study in Sociological Semantics and the Sociology of Science*. Princeton University Press.

Moilanen, J. (2012). Emerging Hackerspaces – Peer-Production, 94–111.

Moraa, H. (2012). *Understanding the Key Factors of the iHub Model*. *iHub Research*. Nairobi: iHub Research.

Moraa, H. (2013). *ICT Hubs study: The impact of ActivSpaces model (in Cameroon) on its entrepreneurs*.

Moraa, H., & Murage, K. (2012a). ICT Hubs Model: Understanding the Factors that make up the Activspaces Model in Buea, Cameroon. iHub Research.

Moraa, H., & Murage, K. (2012b). *ICT Hubs Model: Understanding the Factors that make up Hive Colab Model in Uganda*. iHub Research.

Olma, S. (2012). *The Serendipity Machine - A Disruptive Business Model for Society 3.0*. Creative Commons.

Osman, T. (2013). *Egypt on the Brink - From Nasser to the Muslim Brotherhood*. Totton, Hampshire: Yale University Press. Retrieved from http://books.google.nl/books?hl=en&lr=&id=7VJ_AAAAQBAJ&oi=fnd&pg=PA1&dq=Osman,+Tarek,+Egypt+on+the+Brink+&ots=nO1JhfIBpy&sig=40jUipZQqVlVd9Zy-dAcZqbpNoI&redir_esc=y#v=onepage&q&f=true

Peschl, M. F., & Fundneider, T. (2012). Spaces enabling game-changing and sustaining innovations : Why space matters for knowledge creation and changing and sustaining innovations : Why space matters for knowledge creation and innovation. *Journal of Organisational Transformation and Social Change*, *9*(1), 41–61. doi:10.1386/otsc.9.1.41

Prefontaine, C. (2012). Innovation Spaces, Take Two. *www.facilitatingchange.org*. Retrieved January 22, 2014, from http://facilitatingchange.org/2012/08/innovation-spaces-take-two/

Provatas, M. (2013). *Using Web Startups As A Paradigm Shift For Entrepreneurship In Troubled Economies - The Case of Greece*.

Radwan, M. (2014). Fab Labs in Egypt, bam booming! Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/197/talks/290

Rasheed22_2013. (n.d.).

Re:publica 2014: Into the Wild - Die Konferenz. Das Ereignis. (2014). Retrieved May 26, 2014, from http://re-publica.de/

Schlesinger, J., Islam, M. M., & MacNeill, K. (n.d.). *Founding a Hackerspace*.

Sen, A. (1999). *Development as Freedom*. Oxford: Oxford University Press.

Sen, A. (2008). Capability and Well-Being. In D. Hausman (Ed.), *The Philosophy of Economics. An Anthology* (3rd ed.). Cambridge: Cambridge University Press.

Spinuzzi, C. (2012). Working Alone Together: Coworking as Emergent Collaborative Activity. *Journal of Business and Technical Communication*, *26*(4), 399–441. doi:10.1177/1050651912444070

Stajkovic, A. D., & Luthans, F. (1998). Self-efficacy and work-related performance: A meta-analysis. *Psychological Bulletin*, *124*(2), 240–261.

Stercken, A. (2013). *The entrepreneurial ecosystem in Egypt - two and a half years after the revolution of 25 January*. Cairo.

Stercken, A. (2014). *Innovation Spaces in Cairo - A New Impetus for Sustainable Development? (Part 1)*. Utrecht University.

The World Bank. (2014a). *The Business Models of mLabs and mHubs - An Evaluation of infoDev's Mobile Innovation Support Pilots*. Washington D.C. Retrieved from https://www.infodev.org/mobilebusinessmodels

The World Bank. (2014b). Access to electricity (% of population). *http://data.worldbank.org/*. Retrieved August 30, 2014, from http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS

Troxler, P. (2010). Commons-based Peer-Production of Physical Goods Is there Room for a Hybrid Innovation Ecology ? Fabbing, 1–23.

Troxler, P. (2014). Where's that Revolution? Berlin: Re:publica 2014. Retrieved from https://voicerepublic.com/venues/196/talks/212

Van den Hoff, R. (n.d.). Society 3.0: Knowmads and new value creation. In J. W. Moravec (Ed.), *Knowmad Society*. Education Futures.

Zimmerman, B. (2014). Prototyping the Future on Elephantine Island. *27months*. Retrieved June 23, 2014, from http://www.27months.com/