Positive Ageing: Elements and factors for design

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ABSTRACT
A significant number of models and frameworks have introduced, and been used to support, positive approaches to ageing. They include *Successful Ageing*, *Active Ageing* and *Ageing in Place*, among others. The number of models can create confusion for technology designers who wish to incorporate such models into practice. This paper reviews different models of *positive ageing* in order to distil a comprehensive list of elements and factors that are important to, and supportive of, positive ageing. This list offers designers a useful resource for the design of technology to support positive ageing. Finally, we discuss some gaps found in existing models and offer some insights into how designers could use this paper as a resource for design.

Author Keywords
Ageing, design, positive ageing, elements and factors

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
A great achievement in many developed countries is that citizens are living longer. In response, various bodies, including the World Health Organization (WHO), the European Union and other government agencies, have instigated a number of initiatives in order to meet the opportunities and challenges that ageing populations bring. Different disciplines ranging from biomedicine, psychology, political science, economics, the arts, and gerontology to technology and design have also directed efforts towards this endeavour (Vines et al. 2015).

Human-Computer Interaction (HCI) has long engaged in efforts to design technologies for older people. However, many of its technological solutions have been criticised as being skewed towards assistive and/or prosthetic design (Vines et al. 2015), and labelled by some as being *deficit-driven* (Carroll et al. 2012). This tendency to focus on 'deficit' during the design process has likely been influenced by the dominant biomedical perspective of ageing, where ageing is seen as a medical problem: a state of inevitable functional decline and social disengagement (Bowling & Dieppe 2005; Bowling 2008; Powell 2012; Durick et al. 2013).

More recently, some HCI researchers have turned to various positive models of ageing that consider ageing as part of a life course. While these models acknowledge increasing likelihoods that older people will experience functional decline, they also identify opportunities that can contribute towards older people's independence and social agency (Carroll et al. 2012; Robertson et al. 2012; Durick et al. 2013; Light et al. 2015). These positive models also refigure ageing as being rights-based (as compared to adopting a biomedical or needs-based approach), and include considerations of older people's "independence, participation, care, self-fulfilment and dignity" (WHO 2002, p. 45). Positive ageing models include different frameworks, initiatives and approaches, with the most often used being *Successful Ageing* (Rowe & Kahn 1987; 1997), *Active Ageing* (WHO 2002), and *Ageing in Place* (Sixsmith & Sixsmith 2008; Stones & Gullifer 2014), *Productive Ageing* (Bass et al. 1993), *Ageing-Well (quality of life)* (Bowling 2005) and *Healthy Ageing* (Bryant et al. 2001; Hansen-Kyle 2005). In this paper we refer to these approaches as *Positive Ageing*, to more accurately reflect elderly experiences, show how positivity can 'prolong life expectancy', and to challenge negative views and ageing myths (Kendig & Browning 1997; Robertson 2012; Durick et al. 2013). Positive Ageing describes ageing in terms of success, productivity, active participation and quality of life (Rowe & Kahn 1997; WHO 2002; Bowling 2005; Nayak et al. 2006). In other words, its aim is to "add life to years and not merely years to life" (Minkler & Fadem 2002, p. 229).

While embracing positive ageing can help redress the *deficit-driven* approach to technology design, making sense of the different models/frameworks can be confusing. For example, determining the core considerations and assumptions of each model; assessing whether terms that are common across different models mean the same thing; examining how, and in what ways, one model differs from another; and deciding how specific models complement/overlap with others? The confusion caused by the many and varied models makes it difficult for HCI practitioners who wish to put these models to practical use, i.e., to guide technology design. As such, this paper describes and discusses the most widely used models. More importantly, this paper will present a comprehensive list of factors (or 'requirements') that have been distilled from the models and organised in a way that can be a useful resource for design. Our discussion of how de-

signers might approach the elements (and factors) in the list, as well as consider potential gaps, will add to the usefulness of this resource for design.

METHODOLOGY

We reviewed over 50 sources, which included books, conference papers, journal articles, and a significant number of government and non-government organisation reports that discuss positive ageing models. The sources spanned the disciplines of gerontology, psychology, public policy and HCI.

POSITIVE MODELS OF AGEING

Our literature review found that the most widely discussed positive ageing models are *Successful Ageing*, *Active Ageing,* and *Ageing in Place*. Other models include *Productive Ageing*, *Ageing-Well (quality of life)* and *Healthy Ageing*. The latter models are either narrower in scope and focus, e.g. *Productive Ageing* (Bass et al. 1993), or regarded by some as outcomes of the first three models, e.g. *quality of life* in WHO's (2002) *Active Ageing* definition. Given this, and due to space constraints, this paper focuses on the most widely adopted models. However, when distilling supportive factors to consider for positive ageing, we also include less popular models.

It became clear that each model, and its discourse, is shaped by discipline-specific approaches and assumptions about ageing. For example, Rowe and Kahn proposed a particular biomedical view of Successful Ageing (Bowling & Dieppe 2006), while Kerschner and Pegues (1998) introduced a psychological model of Productive Ageing. Also, the 'sponsor' or funding body of a particular model influenced "what [was] researched, how it [was] researched, and what problems it [sought] to address" (Vines et al. 2015, p. 2). For example, the Active Ageing framework, proposed by WHO (2002), has particular priorities and concerns (see below). Furthermore, we found that many government-supported efforts were directed towards cost-effective solutions to promote health at home; often adopting Ageing in Place models.

Successful Ageing

Successful Ageing became widely recognised following Rowe and Kahn's work (Lamb 2014). Bowling and Dieppe (2005) reviewed over 170 papers of successful ageing, and found that Rowe and Kahn's (1997) medically-oriented model to be the most widely adopted. This model defines success in terms of the absence, and risk reduction, of disease and disability; persons' high functional capacities, and active engagement with life. Some more recent successful ageing models have attempted to complement Rowe and Kahn's model by adding elements, such as spirituality and psychological factors. Others still, e.g. Holstein and Minkler (2003) and McCann Mortimer et al. (2008), have noted that Rowe and Kahn's model is limited by its assumptions about the heterogeneity within ageing populations and its stereotypes about older adults' experiences and expectations.

Active Ageing

The Active Ageing framework was introduced by the World Health Organization (2002) and defined as "[t]he process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age". Six determinants of active ageing were also introduced: *health* and *social services*, *physical environment*, *behavioural*, *personal*, *social* and *economic*. Additionally, WHO (2002) suggested three key pillars to guide ageing policies: *health*, *participation* and *security*. The framework also presented two 'cross-determinants'—*gender* and *culture*—that can influence all six determinants. Unlike *Successful Ageing*, which describes an endpoint and assumes that everyone has "the social, economic and material capital to achieve […] success" (Vines et al. 2015, p. 20), Active Ageing offers a more prescriptive approach to positive ageing.

Ageing in Place

While Ageing in Place has been defined as "remaining living in the community, with some level of independence rather than residential care" (Davey et al. 2004, p. 133), how this model is interpreted and applied has varied (Heumann & Boldy 1993). According to Heumann and Boldy (1993), successful ageing in place occurs when: dignity and independence are maximised, cost is minimised, and access is available to real-housing alternatives, health support and public programs. Ageing in place efforts have typically focused upon older people's social and physical environments, as well as their housing. Prominent areas of interest are people's sociality, health and how technology can support the provision of services, such as telecare (connecting to health practitioners) and telehealth (remote monitoring) in domestic settings (WHO 2007; Wiles et al. 2011; Sanders et al. 2012; Vasunilashorn et al. 2012).

Next, we present a set of elements and factors that have been distilled from all the positive models of ageing presented earlier.

POSITIVE AGEING: PILLARS, ELEMENTS & FACTORS

After distilling the various aspects that each model prescribes as being important to consider when supporting positive ageing, we categorised them according to their shared characteristics. Figure 1 shows how we organised our categorisation, i.e., with three pillars (outer circle of Fig. 1), elements within each pillar (inner dark circle of Fig. 1) and factors related to each element.

We found the three pillars from the Active Ageing model, that is, 1) Health, 2) Participation and 3) Security, to fit well as the highest-level categories, which encompass all elements and factors. Each pillar includes a number of el-

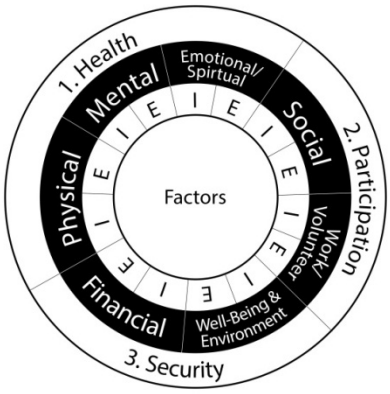

Figure 1. Positive Ageing: Pillars, Elements and (internal /external) Factors

ements. For example, the *Health* pillar includes three elements: *physical, mental* and *emotional/spiritual.* Each element can be influenced by intrinsic (I) and extrinsic (E) factors. Intrinsic factors occur at a personal level (e.g. the will to maintain physically active). Extrinsic factors are influences from others, such as family, community and/or government. Examples of these factors are presented in Table 1, but next we discuss each pillar's potential benefits for technology design.

Pillar 1. Health

Health encompasses *physical*, *mental* and *emotional/spiritual* elements. While the physical and mental are commonly found in positive ageing models, the emotional element—particularly spirituality—tends to be overlooked. The availability of, and access to, adequate care (whether formal or informal) is an enabler to all three elements. Designs that can facilitate or even enhance availability/access to these three elements will better support older people's overall health.

1.1 Physical is about maintaining functional independence. Designs to support healthy behaviours (e.g., exercise), increase awareness about, and access to, adequate health services and informal care can positively influence ageing. Similarly, approaches to help mitigate risks of disease, tobacco use and alcohol consumption (e.g. supporting self-awareness, use of monitoring, access to information, etc.) also aid in positive ageing.

1.2 Mental is concerned with people's cognitive capacities and abilities to cope with life events. Designing opportunities to promote/support self-efficacy, resilience, and overall mental well-being are important. Offering opportunities to develop skills through education, work and socialisation, as well as access to services, are also useful. A number of models have outlined the importance of the familiarity of one's environment to help reduce mental stress. This includes finding ways to support people to 'stay put' (e.g. increase independence or avoid hazards).

1.3 Emotional/Spiritual is often ignored in biomedical models. Factors include the ability to make decisions (autonomy), care for one's home (independence) and self-expression through spirituality, which can "reduce stress and increase purpose and meaning in the face of illness" Crowther et al. (2002, p. 614). Designing technologies to support older people's social lives, i.e., so that they can provide and receive emotional support, can help reduce loneliness and isolation. It can also provide options for older people to maintain dignity through being able to access the appropriate help when needed (e.g. picking up a heavy box), and for technology to prevent or mitigate situations of violence or abuse.

Pillar 2. Participation

Participation includes the elements of *social* relationships and engaging in paid or *volunteer work*. Education has been found to play a major role in developing requisite social skills and increases people's opportunities for meaningful and productive involvement in life. Access to good public infrastructure, particularly with regards to having greater mobility, e.g., easy access to public transport, is another core enabler of participation.

Element	Factors	I/E
Physical	Moderate or strenuous physical activity	I
	Tobacco/alcohol consumption	I
	Good oral Health	I
	Maintain functional independence	I
	Healthy eating/diet	I
	Active at home	I
	Facilitating physical activities	E
	Reduce risks of diseases	E
	Availability of long-term care	E
	Access to health services & promotions (incl. at home)	E
Mental	Education/learn new things	I
	Active at home	I
	Good cognitive capacity	I
	A sense of peace/No regrets	I
	Maintaining intelligence	I
	Self-Efficacy	I
	Familiarity to environment	I
	Resilience	I
	Positive mental outlook	I
	Access to develop skills	E
	Access to mental health services	E
Emotional/ Spiritual	Able to choose where to live	I
	Having spirituality/religion	I
	Able to care for the home	I
	Limiting risks of loneliness & isolation	I
	Limiting risks of violence/abuse	E
	Expressing feelings/emotions	E
	Access to practical help	E
	Access to emotional support	E
Social	Learning in social environments	I
	Meaningful involvement	I
	Having interpersonal social relationships (incl. intergenerational)	E
	Access to social groups & activities	E
	Access to public transport	E
	Access to social support & services	E
Paid Work/ Volunteer	Having functional capacity	I
	Access to education	E
	Access to opportunities for work & volunteering	E
	Active involvement in community	E
Financial	Able to work	I
	Owning one's home	I
	Having an income	E
	Appropriate housing alternatives	E
	Access to social security	E
Well-being and Environment	Safe adequate housing	I
	Familiarity with environment	I
	Distance of home to services, social support and other help	I
	Limit hazards, e.g. reduce falls	E
	Access to clean water, air & safe food	E
	Limiting risks of violence/abuse	E
	Access to good public infrastructure	E

Table 1. Factors related to positive ageing that may be supported through technology design

2.1 Social factors range from an individual's capacity to maintain social relationships with kin and friends, and includes their ability to 'give' (e.g., express interest, kindness and concern to others), spend time with others, and contribute to society. In other words, social factors range from the personal level, to family and close friends, and extend to community and broader society. Support for social factors can positively influence people's physical, mental and emotional/spiritual status. By incorporating an understanding of these factors in the design process, technology has the potential to meaningfully support older people's access to social support and services, as well as opportunities for learning in social environments.

2.2 Paid Work/Volunteering. Engaging in un/paid work allows older people to continue participating in personally meaningful and productive lives. As well as providing a sense of agency and self-worth, work/volunteering enables older people to remain active in their community/ies, which helps maintain their functional capacity and counters myths that older people are social 'burdens'.

Pillar 3. Security

While security is not typically included in positive models of ageing, it is important as it pertains to *financial security* and one's *well-being and environment*.

3.1 Financial independence in later years includes the ability to work, access to income and home ownership. Besides social security programmes, recent moves toward increasing the retirement age in many developed countries may also contribute to older people's financial independence. Financial independence supports individuals' access to food, healthcare, and affordable and 'proper-fit' housing. Therefore, designing technologies that enable or enhance older people's access, and ability, to plan and manage their finances, in addition to ensuring access to social services, is crucial to enabling positive ageing.

3.2 Well-being and Environment relates to older people having access to safe, suitable housing, infrastructure and services, as well as being in a safe and familiar neighbourhood. This element features in the Ageing in Place model, which focuses on technology solutions for older people's environment/s and homes (e.g., fall monitoring/prevention, and access to services and infrastructure).

CONSIDERATIONS FOR DESIGN

In light of positive ageing, this section presents how technology design can utilise the above elements and factors.

Cross influences and unanticipated downsides - It is important to note that factors can exert cross influences, i.e., supporting an element or factor of a particular pillar may influence other pillars. For example, enabling opportunities for education, in order to help people maintain cognitive ability (Health/Mental), can potentially boost their work opportunities (Participation/Work). In turn, this would allow for more income (Security/Financial). Additionally, it should also be noted that supporting a positive factor may bring about unanticipated downsides. For example, supporting older people's familiarity with their homes might increase their sense of security, but also lead to home attachment that prevents them from moving to another setting, if necessary.

Gender and Culture - WHO's Active Ageing (2002) policy framework includes gender and culture as two cross-determinants. However, most ageing models (and technology designs) have not focused on explicating the particular ways that gender shapes positive ageing. While positive ageing efforts in non-Western countries (e.g., Japan and Singapore) are becoming more prevalent, much of the extant work has relied on Western-centric contexts. Therefore, designing technologies to support non-Western cultures will require a degree of 'translation' and attention to differing cultural needs/expectations. For example, many traditional Asian families have strong notions about intergenerational dependencies (Sheykhi 2007). Therefore, being older and 'independent' does not relate to living alone or denying functional and material support from and to younger kin. Instead, within an Asian context, older people's independence is likely to relate to an ability to support their family, e.g. helping with childcare. Similarly, older people's sense of agency is also influenced by their local culture. For example, in Saudi Arabia, women are not permitted to drive. However, this does not mean that they do not possess agency or control. Saudi women exercise their agency by requesting that a family member (or a driver) to take them. In fact, elderly women in Saudi Arabia have significant control over their household affairs. Therefore, as the above examples illustrate, technology design benefits from being grounded in relevant cultural understandings that are developed through contextualised fieldwork in local settings.

Stakeholders - Carers (formal and informal) have a significant role in supporting positive ageing. Formal carers include health care professionals, while informal carers include "family members, friends, or neighbourhoods, or anyone else identified by the senior who is willing to provide informal care" (Xiao et al. 2013, p. 1). However, in relation to technology design, carers are often thought to be passive, i.e., as merely receivers of information and people to be 'activated' during emergencies that relate to the older adult/s in their care. However, in their study about assistive technologies, Procter et al. (2014) present a richer picture of carers and the work they do, for example, customising assistive technologies for the individuals they care for. Additionally, over the last decade or so, in Asian countries like Singapore—where it is common for families to hire live-in, (female) foreign maids—household maids have become primary carers for older family members (Yeoh & Huang 2009). Consequently, designing technology for such carers requires considerations about literacy (e.g., digital, cultural and linguistic), and the power relationships between the maid, older person/s and other family members. Therefore, the following question are valuable to the design process: (1) who is providing the care; (2) what is the nature of their relationship to the older person; (3) what is the care context, and how might this change; and (4) what barriers that may limit any benefits (Tellioğlu et al. 2014).

Finally, if we are to truly make a difference in older people's lives, the factors we have described here always need to be viewed through rich understandings of the dynamic processes and lived experiences of ageing.

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