Success and failure of grassroots innovations for addressing climate change: the case of the Transition Movement

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Giuseppe Feola, *Department of Geography and Environmental Science, University of Reading*

Richard Nunes, *School of Real Estate and Planning, University of Reading*

Corresponding author:

Giuseppe Feola
Department of Geography and Environmental Science,
University of Reading, Whiteknights
RG66AB Reading, United Kingdom
Tel. 0044 118 378 7496, Fax. 0044 118 975 5865, Email: g.feola@reading.ac.uk

Abstract

Grassroots innovations emerge as networks generating innovative solutions for climate change adaptation and mitigation. However, it is unclear if grassroots innovations can be successful in responding to climate change. Little evidence exists on replication, international comparisons are rare, and research tends to overlook discontinued responses in favour of successful ones. We take the Transition Movement as a case study of a rapidly spreading transnational grassroots network, and include both active and non-active local transition initiatives. We investigate the replication of grassroots innovations in different contexts with the aim to uncover general patterns of success and failure, and identify questions for future research. An online survey was carried out in 23 countries (N=276). The data analysis entailed testing the effect of internal and contextual factors of success as drawn from the existing literature, and the identification of clusters of transition initiatives with similar internal and contextual factor configurations. Most transition initiatives consider themselves successful. Success is defined along the lines of social connectivity and empowerment, and external environmental impact. We find that less successful transition initiatives might underestimate the importance of contextual factors and material resources in influencing success. We also find that their diffusion is linked to the combination of local-global learning processes, and that there is an incubation period during which a transition initiative is consolidated. Transition initiatives seem capable of generalising organisational principles derived from unique local experiences that seem to be effective in other local contexts. However, the geographical locations matter with regard to where transition initiatives take root and the extent of their success, and 'place attachment' may have a role in the diffusion of successful initatives. We suggest that longitudinal comparative studies can advance our understanding in this regard, as well as inform the changing nature of the definition of success at different stages of grassroots innovation development, and the dynamic nature of local and global linkages.

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1. Introduction

With a growing body of evidence on human activity induced changes to the Earth's climate (IPCC, 2007) and international governance regimes faltering (Young, 2011), growing attention has been given to local climate change adaptation and mitigation responses. A significant part of this research has focused on urban policy-making and governance (e.g. Burch, 2010; Moloney et al., 2010; Castán Broto and Bulkeley, 2013), including a complementary emphasis on business- or market-led innovation (Grin et al., 2010). Such research has often focused on top-down programmes and on the individual and contextual factors that local authorities can act upon to facilitate behavioural change towards less carbon intensive practices (Bulkeley, 2005; Bulkeley and Kern, 2006; Moloney et al., 2010). However, growing attention has been paid to yet another type of phenomenon, namely 'grassroots innovations', which are not led by municipal institutions, but rather emerge as 'networks of activists and organisations generating novel bottom-up solutions for sustainable development' (Seyfang and Smith, 2007, p. 585; see also Leach et al., 2012).

In this paper we examine the success and failure of grassroots innovations in addressing climate change. To do this, we take the Transition Movement as a case study (Transition Network, 2012). The Transition Movement is a network of local initiatives, which is often presented as a case of success due to its rapid worldwide diffusion and increasing public visibility, although recent analyses of individual cases have uncovered some barriers to its development and examples of failure (Hopkins, 2011; Smith, 2011; Wells, 2011; Seyfang and Haxeltine, 2012). As a result of its formalised international organisational structure and its wide geographical distribution, the Transition Movement represents a relevant case study in that it allows for an exploration of the factors of success and failure of grassroots innovations in different local contexts. We aim to improve the understanding of grassroots innovations and, in particular, to investigate the conditions for their success as a form of response to climate change. What is a successful transition initiative, and what factors facilitate or contribute to its success?

The paper is structured as follows. After a brief overview of the literature on grassroots innovations, we identify the knowledge gaps on the research problem of success and failure of grassroots innovations and state the research questions that guided this study. We then move to the presentation of the methodology, which included a survey-based data collection followed by statistical analysis and clustering of transition initiatives. A presentation of the results follows, whereby we test the initial hypotheses and uncover some configurations of internal and external conditions for success. Finally we discuss this study's results, considering the literature on grassroots innovations and suggesting some promising avenues for future research.

2. Theoretical context

2.1 Principles of transition

The notion of 'transition' has become increasingly central to futures-oriented thinking (Moloney et al., 2010; Mulugetta et al., 2010; Brown et al., 2012), although the term 'transition' is often interpreted differently in practice than in academia, e.g. in transition theory and transition management studies (Haxeltine and Seyfang, 2009). Brown et al. suggest three principles of transition: philosophies, policies and practices. They claim the term is 'increasingly being used to *combine* different forms of transition – lifecourse, environmental, and political-economic' (Brown et al., 2012, p. 1608). The combination of different forms of transition assumes aggregation, consolidation and standardisation of learning processes that underpin the successful growth and development of grassroots innovations. Nevertheless, recent studies illustrate that some fields of grassroots innovations may replicate and develop unencumbered by weak learning processes as a result of peer-to-peer knowledge dissemination (Seyfang and Haxeltine, 2012; Seyfang and Longhurst, 2013). The different political connotations of the term 'transition', and the consequent discord over imagined futures, challenge the assumptions that iterative learning processes and experimentation may lead to a convergence of pro-environmental behaviour towards climate change –

from alternative economies to retrofitting the built environment (TRAPESE, 2008; Holloway and Sergi, 2010).

Secondly, driven forward by such imminent threats as climate change and peak oil, Brown et al. (2012) also suggest transition approaches rely on *compulsion* or affective governance, i.e. 'a sense that the (risk-laden) future is pressing upon the present perhaps more than ever before' (Brown et al., 2012, p. 1619), to hold together community initiatives (see also Smith, 2011). The compulsion may involve the interdependence between local initiatives and non-local networks, whereby the former enact transition practices and experiments informed by the repetitive iteration of narratives of the risk-laden future (Späth and Rohracher, 2012). Though, whilst such partnerships may encourage grassroots innovation success by legitimising, institutionalising and therewith embedding alternative practices into standardised processes, a trade-off between successful diffusion (i.e. replication of experimentation) and innovation control (in the face of diverse values and expectations in different niches) may exist (Ornetzelder and Rohracher, 2013).

Lastly, whilst relying on the rhetoric of global imminent trends, grassroots innovations are the product of local experimentation (North, 2010). Albeit deployed in different ways, Brown et al. (2012) suggest that the spaces, places and scales of transition approaches or their emplacement enable futures narratives to hold together. Transition, they claim, 'does not work without (local) places because those places offer the milieu – and the affective attachments – through which generic senses of responsibility, resilience, and relatedness may be most easily imagined and held together' (p. 1620). Feitelson (1991, cf. Devine-Wright, 2013) first proposed that research on human responses to global climate change had neglected attachment to place (Scannell and Gifford, 2010 for review of definitions), and that these actions could be felt both locally where people live and globally. Devine-Wright (2013) reintroduced this debate to Global Environmental Change, exploring whether cognitive proximity to climate change, as a global problem, can emerge from both global as well as local concerns. The success of grassroots innovations may be rooted in pre-existing networks, and inter-scalar arrangements, which has drawn recent attention to the spatial contexts, or space, scale and place, of socio-technical transitions (Hodson and Marvin, 2010; Coenen et al., 2012; Truffer and Coenen, 2012). In other words, the pro-environmental behaviour associated with grassroots innovations may be neither only 'local' nor 'global', and the local and global linkages to the places, and events through which the practice of adaptation and mitigation is performed, contested and validated, is a pertinent consideration of the diffusion and scale-up of community-led initiatives (Späth and Rohracher, 2012; Nunes, 2013).

2.2 Innovation from the bottom up

Grassroots innovations support the processes of local niche creation, i.e. the incubation of socio-technical innovation in the face of mainstream values, technologies and actors (Seyfang and Longhurst, 2013), although the question remains whether, given the strong local specificity of cultural, social and technological landscapes that inform local grassroots innovations, any generalisation can be drawn on the experiences of community responses to global environmental change (Devine-Wright and Wiersma, 2013). Grassroots innovations may be connected to 'global action networks' (Glasbergen, 2010) and interdependent with the 'global' (Wilson, 2012), whilst retaining a strong connotation to social innovation and resilience through alternatives to conventional markets or a promotion of the 'local' (Glasbergen, 2010; Mayer and Knox, 2010; Devine-Wright and Wiersma, 2013). Because grassroots innovations involve less powerful non-business actors, they are not always visible to and supported by policy makers, and therefore their potential remains largely underdeveloped (Bergman et al., 2010). Nevertheless, many positive accounts of specific grassroots innovations have been provided and grassroots innovations are often seen as niches of experimentation of new social, cultural, economic, technological arrangements (Seyfang and Haxeltine, 2012; Ornetzelder and Rohracher, 2013). It is recognised that grassroots innovations can act as incubators of the social change that is needed to respond to, and minimise, future environmental

change (O'Brien, 2012). Grassroots innovations often challenge the status quo (i.e. technologies, values, practices) and promote new forms of organisation of social and economic life (e.g. local currencies), and alternative systems of provision (such as local food systems and community energy) (Seyfang 2011; Peters et al., 2012).

There is a substantive distinction between technological innovation, and social innovation (Howaldt and Schwarz, 2010). Whereas the former is centred on technological artefact the latter is understood through social everyday practice. Moulaert et al. (2005) identify three dimensions of this practice. The first of these dimensions is addressing human needs, followed by adjusting the dynamics of social relations with the aim of increasing levels of participation and inclusivity, and lastly increasing the capability and access to resources. Thus, we extend the focus of innovation on tangible improvements or solutions to an appreciation of the 'change of attitudes, behaviour, [and] perceptions' (Neumeier, 2012, p. 55), as well as to the potential for new hybrid or emergent forms of collaborative action that may be successful only in generating immaterial or intangible benefits (Howaldt and Schwarz, 2010). Finally, we recognise that what is novel or 'new' is not necessarily socially desirable, especially considering the potential trade-off between successful diffusion of grassroots innovations and innovation control (Ornetzelder and Rohracher, 2013).

2.3 Factors of grassroots innovation success and failure: knowledge gaps

While the role of 'community' is central to grassroots innovations (Aiken, 2012), it has been shown that grassroots innovations do not always internally operate as smoothly as idealised, or function as inclusive and supportive communities of practice (Mulugetta et al., 2010; Walker, 2011). With reference to the links between these communities and the wider community of a place, the literature has highlighted several factors that hinder the diffusion of grassroots innovations. For example, it has been noted that grassroots innovations, like many volunteer organisations, often struggle with securing and sustaining participation over time (Seyfang and Smith, 2007; Hoffman and High-Pippert, 2010; Middlemiss and Parrish, 2010; Smith, 2011; Wells, 2011). Grassroots innovations often rely on volunteers, which limit their ability to promote innovation in the community (Kirwan et al., 2013; Ornetzelder and Rohracher, 2013), and often rely on low levels of financial resources (Middlemiss and Parrish, 2010), which have been shown to be key to supporting learning processes (Seyfang and Longhurst, 2013). Ideological disputes, e.g. between political and apolitical strands, also have been identified to create internal conflict and to act as a barrier to the successful development of grassroots innovations (Smith, 2011), while the management of expectations has been argued to be one of the most difficult aspects for the internal group governance of grassroots innovations (Seyfang and Longhurst, 2013). Finally, grassroots innovations do not always mirror the diversity (e.g. ethnic) of local communities, consequently struggling to establish strong links with the wider community of place (Seyfang and Smith, 2007; Smith, 2011; Wells, 2011). On the other hand, networking with other local or global actors, including other grassroots innovations, can significantly support the process of niche building (Seyfang and Longhurst, 2013).

Therefore, the literature casts doubt on grassroots innovations' ability to effectively trigger socio-technical change in response to environmental change. Such evidence suggests that there is a need for better understanding of 'the internal dynamics and external factors that limit and enable success' (Mulugetta et al., 2011, p. 7544) and the 'pre-conditions, contexts and dynamics' of grassroots innovations (Ornetzelder and Rohracher, 2013, p. 11; see also Seyfang and Smith, 2007; Scott-Cato and Hillier, 2010; Walker, 2011). It has been argued that the 'research base evaluating community-based carbon initiatives is limited in scope and depth' (Walker, 2011, p. 779), and that little evidence or lessons learned exists on scaling-up and replication (Bergman et al., 2010, Walker, 2011). In addition, it has been suggested that 'future research should focus on missed opportunities, and discontinued initiatives to discuss the role of local settings and structural conditions from a *contrasting* point of view' (Ornetzelder and Rohracher, 2013, p. 11). Little research also has been carried out to systematically quantify the impacts of grassroots innovations (e.g. Church and Elster, 2002; Barthelmie et al., 2008), whereby evidence of this impact tends to be anecdotal (Hopkins, 2011; Merritt and Stubbs, 2012). In fact, research on grassroots innovations tends to be based on data-rich,

in-depth case studies, and international comparisons are rare (Bergman et al., 2010; Castán Broto and Bulkeley, 2013). To the best of the authors' knowledge, no study so far has attempted to uncover patterns of success and failure of grassroots innovations across countries. Mapping out these patterns quantitatively would complement in-depth qualitative analysis (Seyfang and Smith, 2007), and provide indications and lessons learned of potential use to those actors (communities, policy-makers and researchers) who are involved in the governance of grassroots innovations and social innovation in the face of environmental change.

3. Methodology

This study addressed the diffusion (i.e. replication) of grassroots innovations in different contexts, and included both active and non-active (i.e. discontinued) initiatives in the Transition Movement, to allow for a comparison between the two. We investigated the factors that facilitate or hinder the success of transition initiatives worldwide, with the aim to i) uncover general patterns of success and failure of grassroots innovations in different contexts and ii) identify research questions with high potential and interest for future research. The study was guided by two overarching research questions: i) what is a successful transition initiative? and ii) what factors facilitate or contribute to the success of a transition initiative?

3.1 Case study: Transition Movement

This study takes the network of local transition initatives, i.e. the Transition Movement, as a case study (Transition Network, 2012). The Transition Movement originated in Totnes, Devon (United Kingdom) in 2006 (Hopkins, 2011). It seeks to deal with climate change, shrinking supplies of cheap fossil fuels ('peak oil'), and a growing recognition of the downsides of the current economic model, made apparent by the 2008 financial crisis (Smith, 2011). The Transition Movement promotes 'energy descent' and local resilience to be achieved through the 'unleashing' of the creativity, motivation and knowledge of communities. A major theme in the Transition Movement is that of re-localisation, which entails the reduction of the dependency on unstable global markets and increasingly more expensive transport. Re-localisation also concerns the willingness of 'transitioners' to take direct action, which is usually focused on a rather definite set of themes, among which food, transport, energy and local currencies are the most frequent (Hopkins, 2011). The Transition Movement has developed in time a set of guidelines, originally modelled on the first transition initiative in Totnes. A *Transition Handbook* (Hopkins, 2008), a *Transition Initiatives Primer* (Brangwyn and Hopkins, 2008) and *Transition Companion* (Hopkins, 2011) have been published. Permaculture is among the most significant intellectual influences of the movement, i.e. a holistic and problem-solving design approach originally developed by Holmgren (2004). The transition model (Brangwyn and Hopkins, 2008) is a set of 12 'steps to transition' that are meant to guide communities to set up a successful transition initiative (Table A.6 in Electronic Supplementary Materials). Communities can adapt these steps to their specific case, and therefore they do not need to make up a compulsory list. They were recently re-elaborated as the 'ingredients' of transition (Hopkins, 2011). The Transition Movement is a transnational grassroots movement active in 41 countries and organized by the Transition Network, which is structured in regional and national hubs, with a central point of reference in the transition initiative in Totnes (United Kingdom). The Transition Network develops the movement's overall strategy and transition guidelines, and delivers training for transitioners, consultancy services, facilitation of information exchange and learning among local transition initiatives. More importantly, the Transition Network also established a system of branding, according to which communities that desire to be recognised as 'official' members of the network need to comply with a set of criteria such as having attended a training session, having drafted and approved a constitution, be composed of at least four or five people and demonstrate commitment to network with others, including locally and with authorities (Brangwyn and Hopkins, 2008; Smith, 2011). Transition initiatives that are inspired by the Transition Movement principles, but that do not comply with these criteria, are listed as 'muller' initiatives.

3.2 Success and failure of transition initiatives

Given the diversity of transition initiatives and their activities in different contexts (Hopkins, 2011; Wells, 2011), it can be controversial to identify universal indicators of success of a transition initiative. Ornetzelder and Rohracher (2013), for example, argued that initiatives may tend to define success either in terms of their internal interactions, or of the external impact, and Devine-Wright and Wiersma (2013) suggested that the former might prevail over the latter. On the other hand, because transition initiatives by and large follow shared guidelines as presented for example in the *Transition Primer* (Brangwyn and Hopkins, 2008) or the *Transition Companion* (Hopkins, 2011), some basic characteristics can be pointed out, or discounted for the differences due to specific local configurations. Following a traditional distinction in social indicator research (e.g. Veenhoven, 2002), we measured the degree of success of a transition initiative through two measures, a subjective and an objective one. The former focused on 'soft' aspects and related to the respondent's awareness and positional evaluation of the transition initiative, while the latter considered 'hard' facts that did not depend on the respondent's awareness or his/her evaluation (Veenhoven, 2002). The subjective measure of success consisted of a Likert scale ('Overall, do you consider your transition initiative very successful, fairly successful, not very successful, or not successful at all?') coupled with an open question to document the subjective idea of success ('What do you think are the three most important characteristics of a successful transition initiative?'). The objective measure of success considered the number of members or people involved in the transition initiative (i.e. critical mass) as suggested by Mulugetta et al., 2010, the duration of the transition initiative, and the progress made towards the 12 steps to transition (proxy for the level of activity and development). The latter was preferred to the 'ingredients' of transition as a measure of activity and development, because the 'ingredients' were only recently introduced and were therefore not widespread among transition initiatives.

3.3 Explanatory factors

Considering earlier evidence on specific case studies of transition initiatives and grassroots innovations more broadly, five groups of interdependent factors that potentially influence the success of transition initiatives were considered: *transition initiative characteristics*, *members*, *resources, organization* and *context*, and respective hypotheses formulated (Table 1).

Many of the selected factors do not identify uni-, but bi-directional relationships between the transition initiative as an incubator of innovative niches and the socio-technical regimes (e.g. food, energy system). As shown by a growing body of literature on grassroots innovations (e.g. Smith et al., 2005; Smith and Raven, 2012), the transition initiative (i.e. niche) can play an active role in interacting with the context (i.e. other niches, the socio-technical regime) and thus contribute to shaping the conditions for its own success or failure. Consequently, many factors, especially among *context* and *resources* (Table 1) are endogenous and must be interpreted as pre-conditions but also as results of a transition initiative's interactions. Such complexity was considered in the data analysis and is discussed later on in this paper. A complete list of the variables measured in relation with each factor and their definition is available in the Electronic Supplementary Materials.

Table 1. Explanatory factors considered in this study.

Group of factors	Factor	Hypothesis. The transition initiative is more successful if:	Reference
Transition Initiative characteristics	Rurality	it is located ina rural/town/village setting in which social networks are denser and social capital higher.	Smith (2011)
	Legal status	it has a legal status that facilitates the interaction with other actors such as local authorities.	Mulgan (2006); Brangwyn and Hopkins (2008)
	Activities/themes addressed	it addresses "easy" themes first and more complex ones at a later stage.	-
	Years needed for a TI to become official	it takes some time to become officially recognised by the Transition Network, i.e. it goes through a significant consolidation and potentially a learning process.	-
	Official vs mulling	it is officially recognised by the Transition Network and therefore benefits of being in such network in terms of e.g. knowledge exchange, training, partnership.	Brangwyn and Hopkins (2008)
	Country	it is located in specific countries.	-
Members	Age	most of its members are at a a specific age	Middlemiss and Parrish (2010)
	Skills	a significant number of steering group members are specifically trained (e.g. group management, motivation, coaching)	Hoffmann and High-Pippert (2010); Brangwyn and Hopkins (2008); Hopkins (2011); Middlemiss and Parrish (2010); Ornetzelder and Rohracher (2013)
	Representation of minorities/diversity	it effectively represents the diversity of the local community	Smith (2011); Quilley (2012)
	Large number of founders	the group of founders was big	Middlemiss and Parrish (2010)
	Educational level	a significant number of steering group members have high educational levels and therefore skills that might be critical in the transition initiative development	Middlemiss and Parrish (2010)
Organisation	Recruitment	it actively recruits its members	Hoffmann and High-Pippert (2010); Wells (2011)
	Paid staff	it can rely on paid staff and therefore does not over-rely on volunteers	Wells (2011)
	Internal conflict/Ideology	it can limit internal ideological conflict and/or managed it positively	Seyfang and Smith (2007); Smith (2011)
	Steering group	it has a steering group	Brangwyn and Hopkins (2008); Hopkins (2011)
	Size of steering group	it has a large steering group	Brangwyn and Hopkins (2008)
	Internal communication	it manages internal communication well	Brangwyn and Hopkins (2008); Hopkins (2011); Ornetzelder and Rohracher (2013)
	External communication	it manages external comunication well	Brangwyn and Hopkins (2008); Hopkins (2011)
	Internal organization by subgroups	it is organised in subgroups (e.g. thematic or project-based)	Brangwyn and Hopkins (2008)
Resources	Infrastructure	it utilises critical infrastructure (e.g. meeting rooms, computers)	Hoffmann and High-Pippert (2010); Middlemiss and Parrish (2010)
	Funding	it can secure sources of funding	Seyfang and Smith (2007); Middlemiss and Parrish (2010)
	Time resources	its members dispose of significant time to dedicate to the transition initiative's activities	Middlemiss and Parrish (2010)
Context	Pre-existence of bottom-up initiatives	it builds on a pre-existing group (e.g. grassroots movement, NGO)	Wells (2011); Ornetzelder and Rohracher (2013)
	Pre-existence of participatory democracy	it is located in a context in which there are forms of participatory democracy which facilitate public participation in local governance	Wells (2011)
	Cooperation/partnership with other organizations	it is able to cooperate or act in partnership with other organizations (e.g. local authorities, business, media)	Brangwyn and Hopkins (2008); Hopkins (2011); Ornetzelder and Rohracher (2013)
	Favourable context	it is located in a context in which other actors(e.g. local authorities, business, media) perceive the transition initiative positively	Mulgan (2006); Seyfang and Smith (2007)

3.4 Data collection and analysis

An online survey was carried out in May–August 2012 through the Surveymonkey platform (www.surveymonkey.com). A list of transition initiatives was built by mining information from the Transition Network website and the websites of its national hubs (United States of America, Ireland, Norway, Sweden, The Netherlands, Canada, Japan, Australia, United Kingdom, New Zealand, France, Portugal, Brazil, Germany, Switzerland, Spain, Chile and Italy). Each transition initiative was invited via email to fill in one questionnaire online. Where possible, the transition initiative's spokesperson was contacted, or otherwise a member of the transition initiative's steering group. In a few cases the invitation to participate in the survey was sent to a general email address provided as a contact point by the transition initiative. 1179 invitations were sent out and one reminder was sent out a month after the first invitation. In addition, the invitation was circulated through social networks where members of the Transition Movement are active (e.g. www.wiser.org, www.linkedin.com, transitionbrasil.ning.com), and websites (e.g. www.transitionresearchnetwork.org, www.reading.ac.uk/rep/transitionresearchreading). The national transition hubs of the Transition Network were also asked to circulate the invitation within their national network. In this way, we attempted to account for the fact that the population of transition initiatives is rather volatile, with new transition initiatives created and others potentially ceasing their activity very frequently, and not being under the radar of the listings that appear on, for example, the Transition Network websites and not necessarily being up to date. The questionnaire was available in English, French, German, Spanish,

Portuguese and Italian. It had two separate but parallel question paths for active and non-active transition initiatives respectively. Data on the non-active transition initiatives related to their activity before being discontinued. The questions were structured into the following sections: *transition initiative characteristics, members, success, organisation, resources* and *context*.

The sample is self-selected and statistically non-representative of the population of transition initiatives. 276 valid questionnaires were returned. The transition initiative's spokesperson (64% of cases) or another member of the transition initiative's steering group (29.6% of cases), that is a person who can be assumed to have a good understanding and overview of the initiative, most frequently completed the questionnaires.The sample over-represents official versus mulling initiatives. With respect to country coverage, it slightly over-represents transition initiatives in the United Kingdom, Italy and Belgium whereas it slightly under-represents those in the United States of America and France (see Tables A.2 and A.3 in Electronic Supplementary Materials for more detail on the sample).

The data analysis was carried out with SPSS 19 in three stages. Firstly, a descriptive analysis of the dependent and independent variables was carried out (sections 4.1 and 4.2 below). Secondly, the driving hypotheses (Table 1) were tested in an exploratory bivariate analysis by means of Pearson Chi-Square test (for categorical variables) and Mann–Whitney U test (for numeric variables) (section 4.3 below). The effect sizes of the relationships were also estimated. Finally, we conducted a multivariate analysis by identifying clusters of transition initiatives via an SPSS two-step cluster analysis (Chiu et al., 2001) based on the variables that in the second stage we found to significantly correlate with the dependent variable (section 4.4 below). This procedure allows robust clusters to be identified in cases of presence of mixed numerical and categorical data, such as in this study. Although the assumption of variable independence did not hold in this study, this procedure has been shown to be robust against violation of this assumption (Norusis, 2012). Clustering allowed for the creation of transition initiative types and therefore was consistent with our research aim to identify general patterns of failure and success, while also accounting for their endogeneity and the high diversity of transition initiatives.

4. Results

4.1. Success and failure of grassroots innovations

The majority of transition initiatives was considered very or fairly successful. The percentage of successful transition initiatives was higher among active than non-active transition initiatives (Table 2).

Table 2. Level of success of transition initiatives.

Level of success	Active transition initiatives		Non-active transition initiatives		All transition initiatives	
	N	%	N	%	N	%
Very successful	36	13.9	0	0.0	36	13.0
Fairly successful	170	65.6	3	17.6	173	62.7
Not very successful	50	19.3	9	52.9	59	21.4
Not successful at all	3	1.2	5	29.4	8	2.9
Total	259	100.0	17	100.0	276	100.0

Transition initiatives tended to define success in terms of four classes of factors, which we labelled *human, external, organisation* and *resources.* The responses to the open-ended survey question, as categorised according to these four factors, are shown in Table A.4 in the Electronic Supplementary Materials. The most highly mentioned characteristics (more than 80 times) of a successful transition initiative were the critical mass of active volunteers or members (*human*), which mirrors the community involvement in the grassroots initiative, and the ability to produce practical effects and achieve concrete goals in the community (*organisation*), i.e. not to limit the activities to informational or awareness-raising campaigns, but rather to produce change in, for example, technologies and practices. A highly cited (69 times) *human* factor was also the capacity to sustain motivation, enthusiasm and to promote a positive, ambitious approach. Among the *human* factors, another set of

characteristics that was frequently mentioned (26 to 39 times) was related to the principles that guide participation in a successful transition initiative, which were considered to revolve around positivity, fun, conviviality and sense of community. Among the *organisation* factors, two areas can be distinguished: outreach and internal group management. For a transition initiative to be successful there is the need for developing outreach projects such as education and awareness-raising in the community. Moreover, vision and leadership were often considered essential characteristics of a successful transition initiative, together with the ability to manage internal activities in a simple, non-bureaucratic manner, democratically and creatively. Among the *external* factors, partnership with different local actors (with other informal organisations or the local authorities) was also frequently considered to contribute to the success of a transition initiative. Overall, it is apparent that the transition initiatives' subjective understanding of success tended to be based on internal rather than external factors.

Table 3 shows a summary of the descriptive statistics of the objective measure of success. A high variation is observed regarding number of members, steps undertaken, and the duration of the transition initiative. Membership of a transition initiative is a floating concept, since most transition initiatives did not require any official membership. Thus, the definition of what a member is varies markedly and might include volunteers but also people connected through mailing lists or social networks. A more meaningful indicator of success might therefore be the number of active transition initiative members, i.e. those who regularly participate in the transition initiative activities (e.g. general organisation, projects and events). In the majority of cases (85%) and in particular in large transition initiatives, the number of active members was lower than the number of total members, while it coincided with the total number of members in the remaining 15% of sampled transition initiatives (not shown in table). Most of the transition initiatives addressed several of the '12 steps to transition' suggested in the *Transition Primer* (Brangwyn and Hopkins, 2008). Regarding duration, on average the transition initiatives had existed for less than four years, which is consistent with the relatively recent development of the Transition Movement, especially outside the United Kingdom. In a marginal number of cases the transition initiative had existed for longer than the Transition Movement itself, which is possibly explained by the fact that the transition initiative pre-existed as a grassroots initiative in some other form, and formally adopted the transition model at a later stage.

As shown in Table 3, the transition initiatives that were *very* or *fairly successful* and those that were *not very* or *not at all successful* differed significantly regarding total members, active members, steps to transition undertaken and duration. In other words, the subjective measure of success initially considered in this study tends to correspond to the objective one.

Table 3. Total members, active members, steps addressed and duration by level of subjective success in active transition initiatives (Mann–Whitney U test).

Variable		Very or fairly successful		Not very or not successful at all
Total members (people)	Mean	189.51	***	42.87
	Std dev	275.37		66.71
Active members (people)	Mean	33.23	***	10.42
	Std dev	35.24		7.33
Steps of transition	Mean	8.88	***	6.79
	Std dev	2.21		2.44
Duration (years)	Mean	3.92	**	3.07
	Std dev	2.82		1.21

** Significant at 5% level; *** Significant at 1% level

4.2. Factors of success and failure of grassroots innovations

4.2.1. Transition initiatives: characteristics and members

Table 4 shows a summary of the variables associated with the *transition initiative characteristics* and *members*. The type of transition initiative was defined based on the conventional Transition Movement denomination (i.e. city/urban, village, town, forest, rural, island). The Transition Network recommends that transition initiatives include a formal organisation (Brangwyn and Hopkins, 2008), which may take several forms such as a trust, cooperative or charitable incorporated organisation, many of which are legal entities. The majority of transition initiatives (64%) were constituted in a legal form and were officially recognised by the Transition Network (57%). On average, it took transition initiatives 10 months to become official.

The most frequent primary overarching themes addressed by the transition initiatives were food (96 cases), energy (45 cases) and education (28) (multiple choice question). In 15 cases the transition initiatives first addressed more than one theme simultaneously (not shown in table).

Active and non-active transition initiatives differ markedly in relation to the proportion of city/urban initiatives (Table 4), the proportion of transition initiatives that received official recognition, and, among 'official' transition initiatives, the number of years that passed from foundation to official recognition.

Overall, less than half of the transition initiatives represent the diversity in their community fairly or very well. The transition initiative members predominantly belong to the age range 30–65 years old, which is reflected by the age range of the steering group members. In about half the cases the transition initiatives were founded on the basis of a pre-existing group (e.g. other grassroots organisation) and the group of founders was on average about 10 people, although a significant variation was observed in this respect.

The data illustrate a predominance of below-university degree level of education, but the response rate to the question regarding educational level was particularly low. In 29% of cases no steering group member of the transition initiative had ever attended a transition training course and in 18% of cases no member had attended permaculture training or had permaculture knowledge. Overall, on average about three steering group members had transition training from the Transition Network and two had permaculture training or knowledge, but high variation within groups was observed. The ratio of steering group members with transition or permaculture training to the total of steering group members was 0.45 and 0.36 (i.e. less than one in two and about one in three) respectively.

In summary, the most marked differences between active and non-active transition initiatives, regarding *members*, were observed in the representation of diversity in the community, the number of initial founders, and the number of steering group members with transition training.

Table 4. Summary of characteristics and member variables (valid % shown).

			Active transition initiatives		Non-active transition initiatives		All transition initiatives	
Factor	**Variable**		**N**	**%**	**N**	**%**	**N**	**%**
Transition initiative charactersitics	Type of transition initiative	City/urban	85	32.8	9	52.9	94	247.4
		Village	24	9.3	1	5.9	25	65.8
		Town	104	40.2	5	29.4	109	286.8
		Forest	1	0.4	0	0.0	1	2.6
		Rural	37	14.3	1	5.9	38	100.0
		Island	8	3.1	1	5.9	9	23.7
		Total	259	100.0	17	100.0	276	100.0
	Legal form	Yes	160	64.3	12	75.0	172	64.9
		No	89	35.7	4	25.0	93	35.1
		Total	249	100.0	16	100.0	265	100.0
	National hub	Yes	6	2.3	0	0.0	6	2.2
		No	246	95.0	17	100.0	263	95.3
		Do not know	7	2.7	0	0.0	7	2.5
		Total	259	100.0	17	100.0	276	100.0
	Regional hub	Yes	44	17.0	4	23.5	48	17.4
		No	201	77.6	12	70.6	213	77.2
		Do not know	14	5.4	1	5.9	15	5.4
		Total	259	100.0	17	100.0	276	100.0
	Official recognition	Yes (Official)	153	59.1	5	29.4	158	57.2
		No (Mulling)	106	40.9	12	70.6	118	42.8
		Total	259	100.0	17	100.0	276	100.0
	Years to become official	Mean	0.83	-	0.67	-	0.82	-
		Std dev	1.15	-	0.82	-	1.14	-
Members	Diversity	Very good	5	2.0	1	5.9	6	2.2
		Fairly good	108	42.2	3	17.6	111	40.7
		Not very good	131	51.2	12	70.6	143	52.4
		Not good at all	12	4.7	1	5.9	13	4.8
		Total	256	100.0	17	100.0	273	100.0
	Age of transition initiative members	Less than 30 years old	9	3.8	1	5.9	10	3.9
		Between 30 and 49 years old	140	58.6	10	58.8	150	58.6
		Between 50 and 65 years old	86	36.0	4	23.5	90	35.2
		More than 65 years old	4	1.7	2	11.8	6	2.3
		Total	239	100.0	17	100.0	256	100.0
	Preexistence group	Yes	130	50.2	11	64.7	141	51.1
		No	105	40.5	5	29.4	110	39.9
		Do not know	24	9.3	1	5.9	25	9.1
		Total	259	100.0	17	100.0	276	100.0
	Founders number	Mean	10.11	-	8.47	-	9.71	-
		Std dev	14.13	-	5.84	-	13.04	-
	Occupation of members	Unemployed	9	3.8	2	11.8	11	4.3
		Student	8	3.3	2	11.8	10	3.9
		In employment	201	84.1	11	64.7	212	82.8
		Pensioner	21	8.8	2	11.8	23	9.0
		Total	239	100.0	17	100.0	256	100.0
	Age of steering group members	Less than 30 years old	6	2.9	1	6.7	7	3.2
		Between 30 and 49 years old	92	44.4	7	46.7	99	44.6
		Between 50 and 65 years old	99	47.8	6	40.0	105	47.3
		More than 65 years old	10	4.8	1	6.7	11	5.0
		Total	207	100.0	15	100.0	222	100.0
	Education of steering group members	No qualification	5	13.2	0	0.0	5	12.2
		Qualification below degree level	17	44.7	1	33.0	18	43.9
		Degree level or above	2	5.3	0	0.0	2	4.9
		Do not know	14	36.8	2	66.0	16	39.0
		Total	38	100.0	3	100.0	41	100.0
	Transition training (people)	Mean	3.03	-	2.2	-	2.98	-
		Std dev	9.82	-	1.32	-	9.49	-
	Transition training ratio	Mean	0.42	-	0.77	-	0.45	-
		Std dev	1.5	-	0.67	-	1.47	-
	Permaculture training (people)	Mean	2.18	-	3.07	-	2.24	-
		Std dev	2.03	-	1.83	-	2.02	-
	Permaculture training ratio	Mean	0.31	-	1.01	-	0.36	-
		Std dev	0.27	-	0.97	-	0.4	-

4.2.2. Organisation

Table 5 shows a summary of the variables associated with the factors *organisation* and *resources*. The majority of transition initiatives had a steering group, although the number of steering group members varied markedly within and between the two subgroups of active and non-active transition initiatives. The transition initiatives usually (94% of cases) did not rely on paid staff, but on voluntary work. 97% of transition initiatives did engage in some form of recruitment of new members (e.g. online or personal contacts, or social events) (Table A.5 in Electronic Supplementary Materials). The majority of active transition initiatives engaged in both internal and external communication and used a diverse set of tools which included a website or blog, social network pages and printed materials. Non-active transition initiatives, before being discontinued, had shown lower levels of engagement in internal and external communication than active transition initiatives (Table A.5 in Electronic Supplementary Materials).

The majority of transition initiatives claimed no political ideology, but in a minority of cases alternative ideologies that refer to ecocentric (e.g. Gaia) or egalitarian worldviews (Douglas and Wildawsky, 1983) were mentioned. Conflicts were, in general, minor and resolved. 49 transition initiatives had had no significant conflict. Reasons for conflicts were i) strategy, direction and priorities of the transition initiative (55 transition initiatives), ii) decision-making, responsibilities or internal management (including time management and leadership) (36 transition initiatives), iii) issues in a specific project (e.g. how to develop an activity) (25 transition initiatives), iv) personalities (9 transition initiatives), and v) communication with other actors (how to do it and what message to communicate) (7 transition initiatives). The vastly predominant strategy for conflict resolution was based on discussion, mediation and consensus-building, which either followed a formal or a more spontaneous protocol, but in several cases (10 transition initiatives) one or more persons left the group after the conflict (not shown in table).

4.2.3. Resources

A certain diversity was observed regarding the proportion of external funding, whereby about 60% of the transition initiatives had developed forms of fundraising that included one or more of the following: grant applications, lotteries, public or private sponsorship, fundraising events, or the sale of self-produced goods. The most frequent sources of external funding were local authorities (49 transition initiatives), donations and sponsorships (e.g. from foundations, banks or other private organisations) (46 transition initiatives), and fundraising through events and sale of self-produced products (35 transition initiatives). There was high variation in terms of time dedicated to transition initiative activities on a weekly basis by the steering group members, which on average amounted to 27 hours per group. Regarding infrastructure, the majority of transition initiatives had access to a meeting room or office and to computing facilities (including printer and video reproduction equipment) (not shown in table). Transition initiatives that did not have access to external funds usually funded their activities through the members' own voluntary monetary contribution.

In summary, the most marked differences observed between active and non-active transition initiatives with respect to *organisation* and *resources* were noted in the number of steering group members, organisation of subgroups, the proportion of external funds and the time dedicated by the steering group members to the transition initiatives.

Table 5. Summary of organisation and resource variables (valid % shown).

Factor	Variable		Active transition initiatives N	%	Non-active transition initiatives N	%	All transition initiatives N	%
Organisation	Steering group	Yes	215	83	15	88.2	230	83.3
		No	44	17.0	2	11.8	46	16.7
		Total	259	100.0	17	100.0	276	100.0
	Number of steering group members	Mean	9.77	-	4	-	9.4	-
		Std dev	18.80	-	2.39	-	18.25	-
	Paid staff	All members of the steering group are paid staff (100%)	2	0.9	0	0.0	2	0.9
		Most of the members of the steering group are paid staff (about 75%)	1	0.5	0	0.0	1	0.4
		There are an equal number of paid staff and volunteers in the steering group	0	0.0	0	0.0	0	0.0
		Some members of the steering group are paid staff (about 25%)	9	4.2	0	0.0	9	3.9
		None of the members of the steering group are paid staff (0%)	203	94.0	15	100.0	218	94.4
		Do not know	1	0.5	0	0.0	1	0.4
		Total	216	100.0	15	100.0	231	100.0
	Subgroups	Yes	142	56.1	6	35.3	148	54.8
		No	111	43.9	11	64.7	122	45.2
		Total	253	100.0	17	100.0	270	100.0
Resources	Proportion of external funding	All funds were external (100%)	32	13.6	0	0.0	32	12.8
		Most of the funds were external (about 75%)	57	24.2	2	14.3	59	23.6
		There were equal proportions of external and internal funds	25	10.6	0	0.0	25	10
		Little funds were external (about 25%)	26	11.0	2	14.3	28	11.2
		No funds were external (0%)	90	38.1	9	64.3	99	39.6
		Do not know	6	2.5	1	7.1	7	2.8
		Total	236	100	14	100	250	100
	Time dedicated by steering group (hours per week)	Mean	27.94	-	16.88	-	27.36	-
		Std dev	23.28	-	11.24	-	22.92	-

4.2.4. Context

Table 6 shows a summary of the variables associated with the factor *context*. The majority of transition initiatives had established forms of cooperation or partnership with local authorities, local media, local business, non-governmental organisations (NGOs) and other grassroots or activist groups, and other transition initiatives.

The majority of transition initiatives also considered to be perceived positively by several local actors including local authorities, local business and media, social enterprises, NGOs, other transition initiatives and regional or national Transition Network hubs. Nevertheless, a significant number of transition initiatives did not have a clear idea of how favourably the transition initiative was perceived (answer: 'Do not know'). By and large, active transition initiatives showed higher rates of cooperation and partnership with other local actors, and a more positive perception of the context (i.e. how favourably different actors were towards the transition initiative).

Table 6. Summary of context variables (valid % shown).

		Active transition initiatives		Non-active transition initiatives		All transition initiatives	
Variables		**N**	**%**	**N**	**%**	**N**	**%**
Cooperation with local authorities	Yes, currently	160	66.4	-	-	-	-
	Yes, in the past	39	16.2	10	62.5	49	19.1
	No	42	17.4	5	31.3	47	18.3
	Do not know	0	0.0	1	6.3	1	0.4
	Total	241	100.0	16	100.0	257	100.0
Cooperation with mass media	Yes, currently	144	59.8	-	-	-	-
	Yes, in the past	52	21.6	12	75.0	64	24.9
	No	45	18.7	2	12.5	47	18.3
	Do not know	0	0.0	2	12.5	2	0.8
	Total	241	100.0	16	100.0	257	100.0
Cooperation with local business	Yes, currently	187	77.6	-	-	-	-
	Yes, in the past	33	13.7	8	50.0	41	16.0
	No	19	7.9	6	37.5	25	9.7
	Do not know	2	0.8	2	12.5	4	1.6
	Total	241	100.0	16	100.0	257	100.0
Cooperation with social enterprises	Yes, currently	108	44.8	-	-	-	-
	Yes, in the past	30	12.4	6	37.5	36	14.0
	No	89	36.9	8	50.0	97	37.7
	Do not know	14	5.8	2	12.5	16	6.2
	Total	241	100.0	16	100.0	257	100.0
Cooperation with NGOs	Yes, currently	187	77.6	-	-	-	-
	Yes, in the past	33	13.7	10	62.5	43	16.7
	No	19	7.9	5	31.3	24	9.3
	Do not know	2	0.8	1	6.3	3	1.2
	Total	241	100.0	16	100.0	257	100.0
Cooperation with other transition initiatives	Yes, currently	154	63.9	-	-	-	-
	Yes, in the past	51	21.2	12	75.0	63	24.5
	No	34	14.1	4	25.0	38	14.8
	Do not know	2	0.8	0	0.0	2	0.8
	Total	241	100.0	16	100.0	257	100.0
Cooperation with regional/national Transition Network hub	Yes, currently	109	45.2	-	-	-	-
	Yes, in the past	48	19.9	7	43.8	55	21.4
	No	76	31.5	9	56.3	85	33.1
	Do not know	8	3.3	0	0.0	8	3.1
	Total	241	100.0	16	100.0	257	100.0
Cooperation with educational institutions	Yes, currently	94	39.0	-	-	-	-
	Yes, in the past	37	15.4	6	37.5	43	16.7
	No	105	43.6	8	50.0	113	44.0
	Do not know	5	2.1	2	12.5	7	2.7
	Total	241	100.0	16	100.0	257	100.0
Favourable context: local authorities	Agree	163	67.6	6	37.5	169	65.8
	Neither agree nor disagree	41	17.0	6	37.5	47	18.3
	Disagree	16	6.6	0	0.0	16	6.2
	Do not know	21	8.7	4	25.0	25	9.7
	Total	241	100.0	16	100.0	257	100.0
Favourable context: local business	Agree	158	65.6	8	50.0	166	64.6
	Neither agree nor disagree	54	22.4	7	43.8	61	23.7
	Disagree	9	3.7	0	0.0	9	3.5
	Do not know	20	8.3	1	6.3	21	8.2
	Total	241	100.0	16	100.0	257	100.0
Favourable context: mass media	Agree	66	27.4	3	18.8	69	26.8
	Neither agree nor disagree	112	46.5	9	56.3	121	47.1
	Disagree	12	5.0	1	6.3	13	5.1
	Do not know	51	21.2	3	18.8	54	21.0
	Total	241	100.0	16	100.0	257	100.0
Favourable context: social enterprises	Agree	127	52.7	4	25.0	131	51.0
	Neither agree nor disagree	50	20.7	7	43.8	57	22.2
	Disagree	2	0.8	1	6.3	3	1.2
	Do not know	62	25.7	4	25.0	66	25.7
	Total	241	100.0	16	100.0	257	100.0
Favourable context: NGOs	Agree	198	82.2	9	56.3	207	80.5
	Neither agree nor disagree	29	12.0	4	25.0	33	12.8
	Disagree	3	1.2	2	12.5	5	1.9
	Do not know	11	4.6	1	6.3	12	4.7
	Total	241	100.0	16	100.0	257	100.0
Favourable context: other transition initiatives	Agree	195	80.9	10	62.5	205	79.8
	Neither agree nor disagree	19	7.9	3	18.8	22	8.6
	Disagree	1	0.4	2	12.5	3	1.2
	Do not know	26	10.8	1	6.3	27	10.5
	Total	241	100.0	16	100.0	257	100.0
Favourable context: regional/national Transition Network hub	Agree	133	55.2	8	50.0	141	54.9
	Neither agree nor disagree	41	17.0	5	31.3	46	17.9
	Disagree	2	0.8	0	0.0	2	0.8
	Do not know	65	27.0	3	18.8	68	26.5
	Total	241	100.0	16	100.0	257	100.0
Favourable context: educational institutions	Agree	102	42.3	6	37.5	108	42.0
	Neither agree nor disagree	57	23.7	5	31.3	62	24.1
	Disagree	6	2.5	0	0.0	6	2.3
	Do not know	76	31.5	5	31.3	81	31.5
	Total	241	100.0	16	100.0	257	100.0

4.3. Factors that contributed to the success of transition initiatives

We explored the contribution of the explanatory factors to the success of transition initiatives (section 3.2) by means of correlation analysis (categorical explanatory factors) and comparison of means (numerical explanatory factors). Table 7 shows the correlation for active transition initiatives between single categorical independent variables and the dependent variable *success*, which was transformed for this purpose into a bimodal variable (i.e. very or fairly successful, not very or not successful at all). This exploratory analysis allowed a first identification of the variables that most significantly influenced the level of transition initiative success. Table 8 compares the means for numerical independent variables between the two groups, i.e. of *very or fairly successful* and of *not very or not at all successful* transition initiatives. Tables 7 and 8 show that several variables significantly correlate with the level of transition initiative success, but the estimated effect size was low for all explanatory factors, indicating low magnitude of the effects of these variables on the success of grassroots innovations.

Table 7. Pearson Chi-Square test and Cramer's V measure of correlation between explanatory factors and success of a transition initiative.

Group	Variable	N	Pearson's Chi-Square	Cramer's V (effect size)	p	
Transition initiative characteristics	Type of transition initiative	259	4.712	0.135	0.095	*
	Legal form	249	8.575	0.186	0.003	***
	First theme addressed	234	17.872	0.276	0.162	
	Official recognition	259	12.549	0.220	0.000	***
	Country #	259	10.212	0.212	0.250	
Members	Age of transition initiative members	239	3.534	0.112	0.316	
	Age of steering group members	207	4.962	0.155	0.175	
	Education of steering group members	24	8.291	0.588	0.016	**
	Diversity	256	14.528	0.238	0.002	***
	Pre-existence group	235	0.312	0.036	0.577	
Organisation	Steering group	259	8.233	0.117	0.004	***
	Subgroups	253	6.578	0.161	0.010	**
	Paid staff	215	3.627	0.130	0.305	
	Conflict resolution	166	0.526	0.056	0.468	
	Political orientation	256	0.081	0.018	0.775	
	Recruitment	259	22.793	0.297	0.000	***
	Web	253	1.938	0.088	0.164	
Resources	Proportion of external funding	230	5.59	0.156	0.018	**
	Meeting room	225	2.273	0.101	0.132	
	Office	236	1.666	0.086	0.197	
	PC	236	1.697	0.086	0.193	
	Printer	236	0.812	0.060	0.367	
	Video reproduction	236	0.789	0.059	0.374	
Context	Participatory democracy	182	1.473	0.090	0.225	
	Cooperation with local authorities	241	12.405	0.227	0.002	***
	Cooperation with mass media	241	11.805	0.221	0.003	***
	Cooperation with local business	239	23.598	0.314	0.000	***
	Cooperation with social enterprises	227	14.297	0.251	0.001	***
	Cooperation with NGOs	239	0.527	0.049	0.753	
	Cooperation with other transition initiatives	239	10.757	0.212	0.005	***
	Cooperation with regional/national Transition Network hul	233	5.818	0.158	0.055	*
	Cooperation with educational institutions	236	2.552	0.104	0.279	
	Favourable context: local authorities	220	13.754	0.250	0.008	***
	Favourable context: mass media	221	15.092	0.261	0.005	***
	Favourable context: local business	190	7.342	0.197	0.119	
	Favourable context: social enterprises	179	9.954	0.236	0.019	**
	Favourable context: NGOs	230	8.639	0.194	0.034	**
	Favourable context: other transition initiatives	215	14.992	0.264	0.002	***
	Favourable context: regional/national Transition Network h	176	15.879	0.300	0.003	***
	Favourable context: educational institutions	165	13.245	0.283	0.010	**

* Significant at 10% level; ** Significant at 5% level; ***Significant at 1% level; # Chi-Square calculated only considering countries with N > 5.

Table 8. Mann–Whitney U test and estimated effect size for numeric independent variables by level of success (bimodal).

Group	Variable	N	Mann-Whitney U test Z	p	effect size
Transition initiati	Years to become official	132	2.046	0.041	0.18 **
Members	Transition training	204	1.488	0.080	0.10 *
	Transition training ratio	193	0.264	0.493	0.02
	Permaculture training	199	2.036	0.042	0.14 **
	Permaculture training ratio	188	0.577	0.502	0.04
	Founders number	247	2.276	0.023	0.14 **
Organisation	Number of steering group members	203	2.607	0.009	0.18 ***
Resources	Time dedicated by steering group	146	0.988	0.323	0.08

* Significant at 10% level; ** Significant at 5% level; ***Significant at 1% level.

We tested for correlation among the variables associated with the factor *context*, i.e. *cooperation* with other actors and *favourable context*. As expected, significant correlations were observed (Pearson correlation between 0.300 and 0.650): transition initiatives who cooperate with other actors tend to consider these actors positively, or vice versa (not shown in table).

Because cities are considered to be more socially diverse than rural/towns, we also analysed the correlation of diversity and success, controlling for the type of transition initiative. In effect, we observed that diversity correlates significantly with success for city/urban transition initiatives but not for other types of transition initiatives, suggesting that the location (i.e. city/urban versus rural/town) influences directly the degree to which a transition initiative represents diversity in its community which, in turn, influences transition initiative success (not shown in table).

Finally, because several transition initiative characteristics are more frequent among official transition initiatives, we analysed the correlation of *subgroups*, *steering committee*, *legal form* with *success* controlling for *official*. transition initiatives that obtain official recognition by the Transition Network tend to be organised in subgroups, have a steering group and constitute a formal organisation more than mulling transition initiatives. We observed that being equal *official*, *steering committee* significantly correlates with *success* for official but not for mulling transition initiatives, whereas *subgroups* and *legal form* significantly correlate with success for mulling but not for official transition initiatives, confirming that the 'official' status influences directly other key variables (transition initiative characteristics), e.g. *subgroups*, *steering committee*, *legal form*, which, in turn influence transition initiative success (not shown in table).

4.4. A typology of transition initiatives

To account for the influence of multiple variables and with the aim to identify common patterns of transition initiative success and failure, in the last stage of our analysis we built clusters based on the variables that had resulted in being significantly correlated with success (subjective, bimodal) (Tables 7 and 8). Following a two-step cluster procedure we identified three clusters of active transition initiatives, in addition to which we analysed non-active transition initiatives as a pre-identified cluster. Table 9 shows a summary of the descriptive statistics for dependent and independent variables for the four clusters. These clusters correspond to four transition initiative types each of which is characterised by a level of success and a particular combination of factors.

Cluster 1. Cluster 1 groups transition initiatives that tended to be very or fairly successful, and to be located in villages, rural areas or towns. In comparison with transition initiatives in other clusters, these transition initiatives were mostly initiated by a larger group of founders. They had existed on average for about four years. While these transition initiatives were not necessarily officially recognised by the Transition Network, those that were officially recognised took one year on average from the foundation year to recognition and followed approximately 10 'steps to transition'. They tended to have a steering group with members trained in Transition and/or permaculture, and to be

organised in, for example, thematic or project-based subgroups. The steering group tended to be larger and to invest a higher number of hours than transition initiatives in other clusters. transition initiatives in this cluster tended to get at least part of their funds from external sources and were very well connected to other actors in the local context, which were generally perceived as favourable towards the transition initiatives.

Cluster 2. Cluster 2 groups transition initiatives that were mostly fairly successful. They tended to be officially recognised by the Transition Network and to have taken almost one year to be recognised since their foundation and followed approximately 8.5 'steps to transition'. They had existed on average for four years, and were founded by relatively few people originally, but were characterised, in comparison with transition initiatives in other clusters, by a large steering group of trained members. They were not necessarily organised in subgroups and usually not constituted in a legal form. They tended to rely on some proportion of external funds and to be located in a favourable context (local authorities, mass media, other NGOs, other transition initiatives, regional or national Transition Network hubs), although this did not necessarily translate into cooperation with other local actors. Cluster 2 transition initiatives tended to cooperate with local authorities and other transition initiatives, but less with other actors. They were more frequently located in the United Kingdom than transition initiatives in other clusters.

Cluster 3. Cluster 3 groups transition initiatives that tended to be not very successful or not at all successful. These transition initiatives tended not to be constituted in a legal form and to be mulling rather than officially recognised. When they were officially recognised by the Transition Network, they tended to have reached recognition rather quickly (i.e. in a few months). They were relatively young (less than three years) and have on average undertaken six to seven 'steps to transition'. These transition initiatives tended not to mirror the diversity of their community very well. If they had a steering group, this tended to be a small group of people of which only few had attended transition or permaculture training. They usually could not rely on external funds and were weakly connected with other actors in their local context, which overall was perceived to disadvantage transition initiatives. In particular, these transition initiatives tended to be more disconnected than those in other clusters from regional or national Transition Network hubs and to have a poorer knowledge of their own context. Finally, they tended to be less concentrated in the United Kingdom than transition initiatives in other clusters.

Cluster 4. These non-active transition initiatives, before being discontinued, shared several characteristics with Cluster 3 transition initiatives. In particular, they achieved similar levels of success, tended to be mulling and not constituted in legal form, to be relatively young (3.6 years) have undertaken six 'steps to transition', and to represent the diversity of their community poorly, also being more frequently located in an urban context. They also tended to be disconnected from the regional and national Transition Network hubs, but, differently from Cluster 3 transition initiatives, they had shown some level of cooperation with other actors in their local context (local authorities, mass media and other transition initiatives). Non-active transition initiatives were usually guided by trained steering group members, but the steering groups tended to be small and to have little time to dedicate to the transition initiative.

Table 9. Descriptive characteristics of key variables for the four clusters of transition initiatives (*part 1*).

			Cluster 1		Cluster 2		Cluster 3		Non-active transition initiatives	
Variable group	**Variable**		**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
	Success	Very successful	19	27.1	7	8.4	3	4.9	0	0.0
		Fairly Successful	48	68.6	62	74.7	32	52.5	3	17.6
		Not very successful	3	4.3	13	15.7	25	41.0	9	52.9
		Not successful at all	0	0.0	1	1.2	1	1.6	5	29.4
	Success (bimodal)	Very or fairly successful	67	91.3	69	83.1	33	55.9	3	17.6
		Not very or not successful at all	3	8.7	14	16.9	26	44.1	14	82.4
Transition Initiative characteristics	Type of transition initiative	Urban/City	23	32.9	29	34.9	19	31.1	9	52.9
		Village/Rural/Forest/Island	16	22.9	17	20.5	21	34.4	3	17.7
		Town	31	44.3	37	44.6	21	34.4	5	29.4
	Legal status	Yes	34	48.6	24	28.9	15	24.6	4	25.0
		No	36	51.4	59	71.1	46	75.4	12	75.0
	Official recognition	Yes	44	62.9	68	81.9	14	23.0	5	29.4
		No ('mulling')	26	37.1	15	18.1	47	77.0	12	70.6
	Years to become official (years)	Mean	1.01	-	0.83	-	0.38	-	0.67	-
		Std dev	1.57	-	1	-	0.51	-	0.82	-
Members	Education of steering group members	No qualification	1	8.3	3	23.1	1	12.5	0	0.0
		Qualification below degree leve	7	58.3	5	38.5	2	25.0	1	33.3
		Degree level or above	0	0.0	1	7.7	1	12.5	0	0.0
	Diversity	Very good	3	4.3	0	0.0	1	1.6	1	5.9
		Fairly good	42	60.0	30	36.1	25	41.0	3	17.6
		Not very good	24	34.3	49	59.0	32	52.5	12	70.6
		Not good at all	1	1.4	4	4.8	3	4.9	1	5.9
	Transition training (people)	Mean	2.6	-	5.08	-	0.92	-	2.2	-
		Std dev	2.7	-	16.22	-	1.18	-	1.32	-
	Permaculture training (people)	Mean	2.84	-	2.03	-	1.64	-	3.07	-
		Std dev	2.55	-	1.77	-	1.66	-	1.83	-
	Founders number (people)	Mean	12.39	-	7.49	-	11.52	-	8.47	-
		Std dev	17.19	-	5.57	-	19.69	-	5.84	-
Organisation	Steering group	Yes	65	92.9	72	86.7	40	65.6	15	88.2
		No	5	7.1	11	13.3	21	34.4	2	11.8
	Number of steering group members (people)	Mean	13.05	-	8.03	-	6.63	-	4	-
		Std dev	30.82	-	5.25	-	3.65	-	2.39	-
	Subgroups	Yes	53	75.7	47	56.6	21	34.4	6	35.3
		No	17	24.3	36	43.4	41	65.6	11	64.7
	Recruitment	Yes	68	97.1	82	98.8	58	95.1	15	100.0
		No	2	2.9	1	1.2	3	4.9	0	0.0
Resources	Proportion of external funding	No external funding	15	21.4	27	32.5	43	70.5	9	28.6
		25% to 100% external funding	55	78.6	56	67.5	18	29.5	4	64.3
	Time dedicated by steering group (hours per week)	Mean	34.37	-	24.6	-	27.85	-	16.88	-
		Standard deviation	29.18	-	16.04	-	22.37	-	11.24	-

Table 9. Descriptive characteristics of key variables for the four clusters of transition initiatives (*part 2*).

			Cluster 1		Cluster 2		Cluster 3		Non-active transition initiatives	
Variable group	**Variable**		**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Context	Cooperation with local authorities	Yes, currently	69	98.6	55	66.3	18	29.5	-	-
		Yes, in the past	0	0.0	22	26.5	13	21.3	10	62.5
		No	1	1.4	6	7.2	30	49.2	5	31.3
	Cooperation with mass media	Yes, currently	63	90.0	43	51.8	21	34.4	-	-
		Yes, in the past	6	8.6	29	34.9	13	21.3	12	75.0
		No	1	1.4	11	13.3	27	44.3	2	12.5
	Cooperation with local business	Yes, currently	55	78.6	34	41.0	12	19.7	-	
		Yes, in the past	8	11.4	22	26.5	5	8.2	8	50.0
		No	7	10.0	27	32.5	43	70.5	6	37.5
	Cooperation with social enterprises	Yes, currently	50	71.4	33	39.8	14	23.0	-	-
		Yes, in the past	6	8.6	20	24.1	2	3.3	6	37.5
		No	10	14.3	30	36.1	41	67.2	8	50.0
	Cooperation with other transition initiatives	Yes, currently	62	88.6	58	69.9	14	23.0	-	-
		Yes, in the past	8	11.4	20	24.1	19	31.1	12	75.0
		No	0	0.0	5	6.0	27	44.3	4	25.0
	Cooperation with regional/national Transition Network hub	Yes, currently	43	61.4	39	47.0	14	23.0	-	-
		Yes, in the past	16	22.9	17	20.5	12	19.7	7	43.8
		No	9	12.9	25	30.1	34	55.7	9	56.3
	Favourable context: local authorities	Agree	61	87.1	60	72.3	23	37.7	6	37.5
		Neither agree nor disagree	5	7.1	18	21.7	14	23.0	6	37.5
		Disagree	1	1.4	4	4.8	9	14.8	0	0.0
	Favourable context: mass media	Agree	58	82.9	56	67.5	27	44.6	8	51.1
		Neither agree nor disagree	9	12.9	21	25.3	19	31.1	7	43.8
		Disagree	1	1.4	5	6.0	2	3.3	0	0.0
	Favourable context: social enterprises	Agree	55	78.8	43	51.8	17	27.9	4	25.0
		Neither agree nor disagree	1	1.4	28	33.7	14	23.0	7	43.8
		Disagree	0	0.0	2	2.4	0	0.0	1	6.3
	Favourable context: NGOs	Agree	63	90.0	64	77.1	51	83.6	9	56.3
		Neither agree nor disagree	3	4.3	14	16.9	7	11.5	4	25.0
		Disagree	0	0.0	2	2.4	1	1.6	2	12.5
	Favourable context: other transition initiatives	Agree	65	92.9	75	90.4	37	57.3	10	52.5
		Neither agree nor disagree	1	5.7	6	7.2	8	13.1	3	18.8
		Disagree	0	0.0	2	2.4	1	1.6	2	12.5
	Favourable context: regional/national Transition Network hub	Agree	47	67.1	49	59.0	24	39.4	8	50.0
		Neither agree nor disagree	4	11.4	23	27.7	9	14.8	5	31.3
		Disagree	0	0.0	1	1.2	1	1.6	0	0.0
	Favourable context: educational institutions	Agree	40	57.1	38	45.8	15	26.3	6	37.6
		Neither agree nor disagree	8	11.4	29	34.9	13	21.3	5	31.3
		Disagree	0	0.0	4	4.8	2	3.3	0	0.0
Control	Country	Argentina	0	0.0	0	0.0	0	0.0	0	0.0
		Australia	5	7.1	6	7.2	4	6.6	2	11.8
		Austria	0	0.0	0	0.0	1	1.6	0	0.0
		Belgium	0	0.0	2	2.4	3	4.9	0	0.0
		Brazil	2	2.9	0	0.0	0	0.0	2	11.8
		Canada	6	8.6	3	3.6	6	9.8	1	5.9
		Chile	1	1.4	0	0.0	0	0.0	0	0.0
		Denmark	0	0.0	1	1.2	1	1.6	0	0.0
		France	3	4.3	3	3.6	4	6.6	1	5.9
		Germany	2	2.9	3	3.6	6	9.8	0	0.0
		Ireland	1	1.4	1	1.2	0	0.0	0	0.0
		Italy	1	1.4	3	3.6	4	6.6	0	0.0
		Latvia	0	0.0	0	0.0	1	1.6	0	0.0
		Netherlands	0	0.0	2	2.4	0	0.0	0	0.0
		New Zealand	1	1.4	1	1.2	0	0.0	2	11.8
		Norway	2	2.9	0	0.0	0	0.0	0	0.0
		South Africa	0	0.0	0	0.0	1	1.6	0	0.0
		Spain	1	1.4	1	1.2	2	3.3	0	0.0
		Sweden	0	0.0	1	1.2	2	3.3	0	0.0
		Switzerland	0	0.0	0	0.0	2	3.3	0	0.0
		United Kingdom	30	42.9	43	51.8	10	16.4	4	23.5
		United States of America	12	17.1	13	15.7	15	24.6	5	29.4
	Duration (years)	Mean	4.16	-	3.98	-	2.69	-	3.63	-
		Std dev	1.99	-	1.45	-	0.99	-	1.09	-
	Steps	Mean	9.87	-	8.51	-	6.77	-	6.00	-
		Std dev	1.61	-	2.27	-	2.00	-	2.92	-

5. Discussion

The analysis of the replication of transition initiatives sheds light on the conditions of success and failure of grassroots innovations in different local contexts. In this section, we summarise this study's main results and discuss its relevance for research on the conditions for grassroots innovation success as a form of response to environmental change in consideration of three under-explored areas of the literature.

5.1. Success and failure of grassroots innovations

The majority of the transition initiatives considered themselves at least fairly successful (Table 2). The literature on grassroots innovations suggests that there are many ways of defining the success or failure of grassroots innovations (e.g. Howaldt and Schwarz, 2010; Kirwan et al., 2013; Ornetzelder and Rohracher, 2013), which is related to the different motivations of grassroots innovations (Seyfang and Longhurst, 2013). Thus, it is generally agreed that the success of grassroots innovations can be identified (i) through their social links to members of local communities, building capacity and empowering social actors (e.g. Middlemiss and Parrish, 2010), as well as (ii) through their external impact or contribution to improved environmental performance (Barthelmie et al., 2008), or different trajectories of systemic socio-technical innovation (e.g. Geels and Schot, 2007).

Our results confirm the coexistence of these two broad sets of criteria. The respondents defined the success of their transition initiative by referring both to the social function (exemplified by the values of conviviality, 'fun', or sense of community) and external impact, with a critical mass of members being a characteristic that cross-cuts the two dimensions (Table A.4 in the Electronic Supplementary Materials). Democratic organisational principles also were considered to be key characteristics of successful transition initiatives, which confirms what has been suggested by other studies (e.g. Seyfang and Smith, 2007; Kirwan et al., 2013; Ornetzelder and Rohracher, 2013). These results were consistent with the objective measure of success, whereby subjectively successful transition initiatives also tended to be more mature (i.e. have lasted longer), to involve more members, and to undertake more 'steps to transition'. Though the latter only should be taken as a proxy for the level of transition initiative development, considering that these steps represent general guidelines and principles (Brangwyn and Hopkins, 2008) that are locally adapted (Pickerill and Maxey, 2009), they should be taken as a means, rather than a goal, of transition. In addition, some of the steps to transition have a cyclical nature rather than being one-off targets. Nevertheless, together with the other objective indicators, the steps to transition may provide an indication of the underpinning dynamics of capacity building, social links to local communities, and narrative and identity development that have been suggested to be key factors in the success of grassroots innovations (Middlemiss and Parrish, 2010; Connors and McDonald, 2011; Feola, 2012).

The results also suggest that less successful transition initiatives might underestimate contextual factors and material resources, which this study shows are significant in the success of transition initiatives (Tables 7 and 8). Transition initiatives might have a low awareness of contextual conditions of success or failure, and instead, tend to consider the factors they can control as the most important, among which are the recruitment, self-organisation and motivation of members. The little importance given to material resources might be explained by the high reliance of most of transition initiatives on the contribution of volunteers (Table 4), which however is often a barrier to success (Smith, 2011). Such a mismatch in the consideration given to conditions of success or failure might be due to a tendency to look inwardly. This may be a result of the necessity to build up innovative niches, especially in the early stages of transition initiative development where the majority of respondents identify their initiatives. Thus, a corollary of this finding would suggest the criteria used for assessing success, both subjectively and objectively, might change during the development of a grassroots innovation, and consequently also the evaluation of those criteria. This is a hypothesis worth testing in future research.

5.2 Factors of success and failure of grassroots innovations

Our results confirmed many of the hypotheses, albeit mostly drawn from single in-depth case studies, present in the literature that guided this study (Table 1). We identified types of transition initiatives that were based on typical configurations of conditions for success and failure into four clusters (Table 9), which occur in different contexts. These ideal types do not represent formulae for more, or less success. Rather, the complex nature of socio-technical systems and the high diversity of grassroots innovations make success or failure unpredictable (Bergman et al., 2010). We did not unravel the varied interrelationships among factors of grassroots innovations' success or failure, which generate these patterns of local configurations, although we do argue that the identified ideal types represent a useful step forward in the understanding of local settings and structural conditions (Ornetzelder and Rohracher, 2013) that may facilitate or hinder the diffusion of grassroots innovations.

Following Brown et al. (2012), we discuss here these ideal-types in relation to the three under-explored areas of interrelated literature referred to earlier in this paper: i) the *combination* of different forms of transition – lifecourse, environmental and political-economic – which assumes a consolidation and standardisation of learning processes that may drive the growth and development or replication of grassroots innovations (Seyfang and Longhurst, 2013); ii) the *compulsion* to act through a form of affective governance that, in seeking to embed an alternative to conventional processes, results in a trade-off between successful diffusion and innovation control (Geels and Schot, 2007; Ornetzelder and Rohracher, 2013); and lastly iii) the *emplacement* or spatial contexts of socio-technical transitions (Coenen et al., 2012; Devine-Wright, 2013).

First, our results do suggest that transition initiatives' growth and development is linked to the *combination* of local–global (trans-local) learning processes (e.g. externally resourced transition training/permaculture training). This would confirm that transition initiatives may be interdependent with global action networks whilst retaining a strong promotion of the 'local' (Mayer and Knox, 2010; North, 2010; Wilson, 2012). Also, cooperation with other transition initiatives in the Transition Movement and other actors such as local authorities and businesses is essential to transition initiative success. Yet despite most transition initiatives acknowledging a favourable context for such cooperation, least successful transition initiatives have not engaged with other actors.

In addition, several transition guidelines, promoted by the Transition Network at the transition initiative level, mark the difference between clusters of highly or less successful initiatives (Table 9). In particular, the Transition Network recognition of transition initiatives and the organisation into subgroups are related to transition initiative success. They interact with other important factors such as the level of human resources (i.e. size of the steering group for those transition initiatives that have one), time and money (external funds), which confirms earlier evidence presented by Middlemiss and Parrish (2010).

Our results also suggest that there may be an incubation period for success of approximately four years (Table 9). Moreover, a longer period before becoming 'official' is associated with high levels of success (Table 9), which reinforces the hypothesis of an incubation period during which the transition initiative is consolidated and builds the basis for future success. However, future longitudinal studies will be required to test this hypothesis. These results suggest that there may be a point when transition-related learning processes, evident in transition initiative growth and development may peak or plateau due to a limited supply of volunteer support. Alternatively, these results may be an indicator of 'creative destruction' or learning processes where old knowledge and ways of learning are discarded in favour of new approaches or recombined with new ideas or processes. Therefore, grassroots innovation success may be consistent with learning cycles of intermittent periods of coherence as well as fragmentation and variety, considering transition initiative success is conditional upon resources and membership activity, whereby peer-to-peer knowledge dissemination complements a process of dis/aggregation, re/consolidation and de/standardisation (Seyfang and Longhurst, 2013). A similar cyclical development has been identified in social innovation by Westley

et al. (2006) and Biggs et al. (2010). Overall, this would suggest that transition initiative success remains largely determined by situated processes despite its interdependence with global action networks.

Second, we find that the context of transition initiative success or failure can be linked to a *compulsion* to act. Despite the lesser role of steering groups, as well as the legal status or official recognition of transition initiative success, the formal structure of the Transition Network seems to play a significant role in at least two ways. Firstly, it generates the grand narrative of transition (Feola, 2012) and delivers the training that equips local groups with the skills needed to cope with and manage the transition process. The training is often based on mature successful experiences and therefore it also has a function of knowledge sharing that supports learning and niche building (Seyfang and Longhurst, 2013). Secondly, the Transition Network provides general principles and organisational guidelines such as the 12 'steps to transition' (Brangwyn and Hopkins, 2008; Connors and McDonald, 2010), several of which, including those related to internal organisation and collaboration with other actors, we found to be associated with a high degree of transition initiative success (Tables 7, 8 and 9). Thus, in contrast to what Devine-Wright and Wiersma (2013) suggest, the Transition Movement seems capable of generalising organisational principles derived from 'unique' local experiences that overall seem to be effective in other unique local contexts, and to 'hold the future [orientation for the movement] together' (Brown et al., 2012, p. 1616).

Lastly, this brings us to our final consideration of the *emplacement* of transition initiatives. Despite the frequent and active use of online social networking made within and between transition initiatives in the Transition Movement, this study also suggests that the geographical location of the transition initiative matters. Transition initiatives located in areas characterised by a higher density of other transition initiatives and where there are active regional or national Transition Network hubs, have a greater chance of interacting with other transition initiatives, as was the case for transition initiatives in the United Kingdom (Truffer and Coenen, 2012). This seems to confirm the positive role played by networking among grassroots innovations for their success (Seyfang and Longhurst, 2013), and suggests the importance of 'offline' contact despite the growing use of 'online' tools for communication, information sharing and recruitment. These results are also consistent with those suggested by Mulugetta et al. (2010), according to whom 'it is much easier for neighbouring communities to share experiences since they are likely to face similar problems and can negotiate a shared vision about addressing climate mitigation and adaptation requirements' (Mulugetta et al., 2010, p. 7543). On the contrary, geographically isolated transition initiatives, even if virtually connected (online) in the Transition Movement, seem more at risk of being discontinued or to struggle to achieve momentum and thrive.

We also find that the least successful or non-active transition initiatives are located predominantly, although not exclusively, in urban areas (Table 9). Long-established research (e.g. discussed by Lewicka, 2011) has explored the links between place attachment and pro-environmental behaviour, and recent studies have begun to explore global level, as well as local level attachments (Devine-Wright, 2013). Our results would suggest that local attachments among urban transition initiatives are weak and not compensated by global attachments to the wider Transition Network. Whether this is due to some combination of dynamic urban characteristics that do not reinforce local attachments to place, and the 'eco-localisation' response to climate change by the Transition Movement (North, 2010; Mason and Whitehead, 2012) is unclear. On a related note, our results also confirm that the level of diversity representation and inclusivity is lowest among urban transition initiatives. This may suggest that other complementary values, motivations and routes to low-carbon lifestyles need to be explored (Antonsich, 2010). The importance of diversity representation has been pointed out by previous studies, albeit without reference to a specific type of transition initiative.

5.3 Limitations and directions for future research

The literature has shown that the development of grassroots innovations is not linear, but is likely to be proceeded by a sequence of positive and more critical periods that might involve several failed attempts before success occurs (Bergman et al., 2010; Biggs et al., 2010). As suggested by this study,

it seems that grassroots innovations go through an initial period of incubation during which they take momentum (see also Ornetzelder and Rohracher, 2013 and more generally the literature on transition, e.g. Smith et al., 2005). As mentioned above, in the course of such development not only the value of the indicators of success and failure may change significantly, but there might be the need for different indicators, both subjective and objective. Due to its cross-sectional nature, this study could not capture such dynamics. For the same reason, it was not possible in this study to determine what conditions play a significant role at what stage of the transition initiative development. It can be hypothesised that some configurations of factors might exert influence at particular development stages of grassroots innovations. For example, skills acquisition, e.g. through the transition training, might be particularly important in the early stages of grassroots innovation development. These aspects have potentially important policy and practical implications and therefore represent an interesting avenue for future research that should be addressed with a longitudinal research design, including case studies with focused surveys or long-term 'panel' studies.

It is also widely acknowledged that the success or failure of grassroots innovations, especially if measured in terms of external impact on a socio-technical regime, depends on the simultaneous pressure of the grassroots innovation 'niche' and 'landscape' trends, which create windows of opportunity for change (e.g. Smith et al., 2005). The failure of grassroots innovations is often ascribed to the co-option of its innovative values, practices or technologies by the mainstream (e.g. Smith, 2005; Bergman et al., 2010). While some global framings of risk such as climate change and peak oil exist, and are indeed utilised by the Transition Movement to build its grand narrative (Brown et al., 2012; Feola, 2012), the success of individual transition initiatives is likely to depend also on regional or local framings that we were unable to investigate in this study. Nevertheless, more work is required on grassroots innovation success *and* failure, and its roots in pre-existing networks, institutional 'lock-in', as well as the local and global linkages to the place, sites and situations or events through which the practice of climate change adaptation and mitigation is performed, contested and validated (Nunes, 2013). A more systematic comparative investigation of such niche–landscape dynamics in different spatial contexts could shed further light on the configurations of conditions that favour or hinder the successful replication and scale-up of grassroots innovations.

6. Conclusions

In this first international survey of transition initiatives of the Transition Movement, we have identified definitions of success factors in the literature on transition and have linked varying configurations of these factors to different degrees of success and failure. This study has shed light on the diffusion (i.e. replication) of grassroots innovations in different contexts, complementing in-depth, and mostly qualitative, case studies of individual grassroots innovations. It also offers new insights into open theoretical questions that inform future research on transition towards sustainable and resilient communities, as well as the on-going practice and future pursuits of transition initiatives.

We conclude that the success of transition initiatives is defined along the lines of social connectivity and empowerment, and external impact or contribution to environmental performance. In this paper we have correlated the success of transition initiatives to objective measures of activity and participation (i.e. members, duration, activities undertaken – steps to transition), though there remains scope for refining these objective measures, e.g. a function of different development stages of transition initiatives. We also conclude that transition initiative members tend to focus on internal, and overlook external factors of transition initiative success, which may be related to a lack of awareness of their environment, of skills to engage with it, or the need to focus on the most controllable factors in early stages of development. Nevertheless our results do suggest that, whilst there is no formula for more, or less success, transition initiatives can be arranged into four typical configurations or clusters of variable success and failure.

Finally, in our discussion of these survey findings we shed light on some key open issues in transition theory with regard to the combination of different forms of transition, the compulsion to act, as maintained by the reiterated narratives of risk-laden futures, and the emplacement or 'place attachment' of transition initiatives. We identify two interrelated observations. First, our research suggests that transition initiatives remain largely determined by situated processes despite their interdependence with a global action network like the Transition Movement. In other words local and global 'place attachments' encourage pro-environmental behaviour, but local contextual factors largely determine the success and failure of associated community initiatives. Second, in contrast to what Devine-Wright and Wiersma (2013) suggest, whilst the Transition Network seems capable of generalising organisational principles of good practice from 'unique' local experiences that may have global application, our results suggest that local place attachments among urban transition initiatives are weak and not compensated by their interdependent links to global action networks. Both observations arguably have significant implications for future research on the growing interest in low-carbon urban initiatives and merit future investigation through longitudinal studies.

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Appendix

Table A.1. Independent variables.

Group	List of variables	Description
Transition initiative characteristics	Type of transition initiative	Urban/city; Village; Rural; Forest; Island; Town
	National hub	The Transition initiative is a national Transition Network hub
	Regional hub	The Transition initiative is a regional Transition Network hub
	Legal form	The Transition initiative is constituted in a legal form
	Themes addressed	Theme addressed through community initiatives: Arts and Crafts; Business and Economics; Diversity and Social Justice; Education; Effective groups; Energy; Food; Health; Housing; Inner transition; Locla government; Transport; Other theme; Multiple themes
	First theme addressed	First theme addressed through community initiatives: Arts and Crafts; Business and Economics; Diversity and Social Justice; Education; Effective groups; Energy; Food; Health; Housing; Inner transition; Locla government; Transport; Other theme; Multiple themes
	Official recognition	The Transition initiative has achieved official recognition of the Transition Movement
	Years to become official	The number of years from foundation to official recognition of the Transition Movement
Members	Age of members	<30; 31<>49; 50<>65; >65
	Transition training	Number of members of the steering group that have had official (i.e. delivered by the TTN) transition training
	Transition training ratio	Ratio of members of the steering group with official transition training on the total of steering group members
	Permaculture training	Number of members of the steering group that have had training in permaculture or have knowledge of it
	Permaculture training ratio	Ratio of members of the steering group with training in permaculture or have knowledge of it on the total of steering group members
	Education of steering group members	Level of education of the steering group members: no qualification; below university degree level; university degree level or above
	Occupation	Occupation of the majority of Transition initiative members: Unemployed, Student; In emplyment; Pensioner
	Diversity	How well the composition of the Transition initiative members mirrors the diversity in the community: Very good; Fairly good, Not very good, Not good at all
	Founders number	Number of original founders of the transition initiative
	Preexistence group	The founders of the transition initiative belonged to another grassroots group before founding the transition initiative
Organisation	Steering group	The transition initiative has a steering/coordination group
	Number of steering group members	Number of steering group members
	Subgroups	The transition initiative is organised in subgroups
	Paid staff	Poportion of members of the steering group that are paid staff: All members of the steering group are paid staff (100%); Most of the members of the steering group are paid staff (about 75%); There are an equal number of paid staff and volunteers in the steering group; Some members of the steering group are paid staff (about 25%); None of the members of the steering group are paid staff (0%)
	Recruitpers	The transition initiative recruits new members through personal contacts
	Recruitwork	The transition initiative recruits new members through workshops
	Recruitevent	The transition initiative recruits new members through communication events
	Recruitweb	The transition initiative recruits new members through website
	Recruite	The transition initiative recruits new members through electronic materials (e.g. newsletter)
	Recruitprint	The transition initiative recruits new members through printed materials
	Recruitno	The transition initiative does not actively recruit new members
	Conflict resolution	The transition initiative has mechanism for effective conflict resolution
	Political orientation	The transition initiative has a declared political orientation
	Intcompers	The transition initiative communicates internally by means of personal contacts
	Intcomwork	The transition initiative communicates internally by means of workshops
	Intcomevent	The transition initiative communicates internally by means of communication events
	Intcomweb	The transition initiative communicates internally by means of website
	Intcome	The transition initiative communicates internally by means of electronic materials (e.g. mailing list)
	Intcomprint	The transition initiative communicates internally by means of printed materials
	Intcomno	The transition initiative does no communicate internally
	Intcomother	The transition initiative communicates internally by other means
	Extcompers	The transition initiative communicates externally by means of personal contacts
	Extcomwork	The transition initiative communicates externally by means of workshops
	Extcomevent	The transition initiative communicates externally by means of communication events
	Extcomweb	The transition initiative communicates externally by means of website
	Extcome	The transition initiative communicates externally by means of electronic materials (e.g. mailing list)
	Extcomprint	The transition initiative communicates externally by means of printed materials
	Extcomno	The transition initiative does no communicate externally
	Extcomother	The transition initiative communicates externally by other means
	Web	The transition initiative has an online presence (website, blog, social network page)
Resources	Proportion of external funding	Proportion of funds that is external: All funds were external (100%); Most of the funds were external (about 75%); There were equal proportions of external and internal funds; Little funds were external (about 25%); No funds were external (0%)
	Time dedicated by steering group	Hours per week dedicated to the transition initiative by the steering group members
	Resroom	The Transition initiative disposes of a meeting room
	Resoffice	The Transition initiative disposes of an office
	Respc	The Transition initiative disposes of a computer
	Resprint	The Transition initiative disposes of a printer
	Resvideo	The Transition initiative disposes of equipment for video reproduction
Context	Participatory democracy	There are forms of participatory democracy in the locality
	Cooperation with local authorities	The transition initiative cooperates with local authorities: Yes currently; Yes in the past; No
	Cooperation with mass media	The transition initiative cooperates with local mass media: Yes currently; Yes in the past; No
	Cooperation with local business	The transition initiative cooperates with local businesses: Yes currently; Yes in the past; No
	Cooperation with social enterprises	The transition initiative cooperates with social enterprises: Yes currently; Yes in the past; No
	Cooperation with NGOs	The transition initiative cooperates with other NGOs: Yes currently; Yes in the past; No
	Cooperation with other Transition initiatives	The transition initiative cooperates with other transition initiatives: Yes currently; Yes in the past; No
	Cooperation with regional/national Transition Network hub	The transition initiative cooperates with regional/national Transition Network hubs: Yes currently; Yes in the past; No
	Cooperation with educational institutions	The transition initiative cooperates with research/educational institutions: Yes currently; Yes in the past; No
	Favourable context: local authorities	The transition initiative thinks it is well perceived by local authorities: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: mass media	The transition initiative thinks it is well perceived by local mass media: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: local business	The transition initiative thinks it is well perceived by local businesses: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: social enterprises	The transition initiative thinks it is well perceived by social enterprises: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: NGOs	The transition initiative thinks it is well perceived by other NGOs: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: other TIs	The transition initiative thinks it is well perceived by other transition initiatives: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: regional/national Transition Network hub	The transition initiative thinks it is well perceived by regional?national Transition Network hubs: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly
	Favourable context: educational institutions	The transition initiative thinks it is well perceived by research/educational institutions: Agree strongly; Agree, Neither agree nor disagree; Disagree; Disagree strongly

Table A.2. Geographical distribution of the population* and sample** of transition initiatives.

	Population		Sample	
Country	N	%	N	%
Argentina	2	0.2	1	0.4
Australia	82	7.0	18	6.5
Austria	5	0.4	1	0.4
Bangladesh	1	0.1	0	0.0
Belgium	17	1.4	7	2.5
Brazil	4	0.3	5	1.8
Canada	67	5.7	17	6.2
Chile	2	0.2	2	0.7
Denmark	5	0.4	2	0.7
Finland	1	0.1	0	0.0
France	62	5.3	11	4.0
Germany	71	6.0	15	5.4
Greece	2	0.2	0	0.0
Hungary	2	0.2	0	0.0
India	1	0.1	0	0.0
Ireland	27	2.3	3	1.1
Isle of Man	1	0.1	0	0.0
Italy	29	2.5	10	3.6
Japan	3	0.3	0	0.0
Latvia	1	0.1	1	0.4
Luxembourg	1	0.1	0	0.0
Mauritius	1	0.1	0	0.0
Mexico	1	0.1	0	0.0
Mozambique	1	0.1	1	0.4
Netherlands	9	0.8	2	0.7
New Zealand	59	5.0	4	1.4
Nigeria	1	0.1	0	0.0
Norway	3	0.3	2	0.7
Philippines	1	0.1	0	0.0
Poland	1	0.1	0	0.0
Portugal	17	1.4	0	0.0
Saint Vincent and the Grenadines	1	0.1	0	0.0
Slovenia	1	0.1	0	0.0
South Africa	2	0.2	1	0.4
Spain	9	0.8	4	1.4
Sweden	6	0.5	4	1.4
Switzerland	7	0.6	3	1.1
Taiwan	1	0.1	0	0.0
Thailand	1	0.1	0	0.0
United Kingdom	377	32.0	107	38.8
United States of America	294	24.9	55	19.9
TOTAL	1179	100	276	100.0

* Sources: Transition Network website and national hubs (United States of America, Ireland, Norway, Sweden, The Netherlands, Canada, Japan, Australia, United Kingdom, New Zealand, France, Portugal, Brazil, Germany, Switzerland, Spain, Chile, and Italy). These figures are to be intended as estimates due to the volatile nature of TIs.

** Only valid responses shown.

Table A.3. Official and mulling transition initiatives as listed in the Transition Network website and in the sample.

	Population*		Sample	
Variable	N	%	N	%
Official	421	40.4	158	57.2
Mulling	620	59.6	128	46.4
TOTAL	1041	100.0	276	100.0

* As indicated in the Transition Network website (accessed in June 2012).

Table A.4. Characteristics of a successful transition initiative (aggregated data for first, second and third most important characteristics).

Factor	Characteristic	Total times mentioned
Human factors	Critical mass of active volunteers/members, community involvement	88
	Enthusiasm, positive approach, energy, commitment, ambition	69
	Inclusiveness, diversity	39
	Patience, perseverance, continuity of activities, resilience	34
	Conviviality, harmony, sense of community, collaboration	32
	Fun, happiness, enjoyability, celebration	26
	Integrity, honesty, respect, tolerance, ability to listen	17
	Appropriation, empowerment, inner transition	9
	Common values and beliefs, likemindness, cohesion	4
External factors	Non-specified partnership/networking	24
	Partnership/networking with other organizations	18
	Partnership with local government	11
	Place size/favourable local population/mass media	4
Organisation	Effectiveness, practical/concrete focus, achievement of goals, active presence in society	84
	Knowledge, awareness raising, education, information	46
	Leadership, core group	34
	Planning, vision, clear goal/purpose, inspiration	30
	Visibility, events	30
	Communication (internal/external)	26
	Flexibility, open-ended, simplicity, "let it go"	19
	Democratic, non-hierarchical, non-burocratical process	16
	Creativity, ideas	15
	Conflict resolution, organisation and groupwork skills	14
	Opennes	10
	Working groups	7
	Self-awareness, learning from mistakes	3
Resources	Financial resources	15
	Time	7
Other		36

Table A5. Means of internal and external communication available to transition initatives.

Variables		Active transition initiatives N	Active transition initiatives %	Non-active transition initiatives N	Non-active transition initiatives %	All transition initiatives N	All transition initiatives %
Internal communication	Personal contacts	163	62.9	11	64.7	174	63.0
	Workshops	56	21.6	2	11.8	58	21.0
	Communication events	58	22.4	2	11.8	60	21.7
	Website	122	47.1	2	11.8	124	44.9
	Electronic materials (e.g. newsletter)	170	65.6	9	52.9	179	64.9
	Printed materials	19	7.3	1	5.9	20	7.2
	Other	77 §	29.7	4 *	23.6	81	29.3
External communication	Personal contacts	161	62.2	10	58.8	171	62.0
	Workshops	103	39.8	6	35.3	109	39.5
	Communication events	139	53.7	5	29.4	144	52.2
	Website	185	71.4	5	29.4	190	68.8
	Electronic materials (e.g. newsletter)	136	52.5	6	35.5	142	51.4
	Printed materials	102	39.4	5	29.4	107	38.8
	Other (phone, social network)	67 §§	25.9	2 **	11.8	69	25.0

* phone, emails; ** exibition, local press; § emails, online groups and social media; § emails, social media, local press.

Table A6. 12 Steps to Transition (Brangwyn and Hopkins, 2008).

Number	Steps
1	Set up a steering group and design its demise/transformation from the outset
2	Start raising awareness
3	Lay the foundations
4	Organise a Great Unleashing
5	Form theme (or special interest) groups
6	Use Open Space
7	Develop visible practical manifestations of the project
8	Facilitate the Great Reskilling
9	Build a bridge to Local Government
10	Honour the elders
11	Let it go where it wants to go…
12	Create an Energy Descent Action Plan