

## Dynamism in policy-affiliated transition intermediaries

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## Dynamism in policy-affiliated transition intermediaries

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### ABSTRACT

Transition intermediaries are actors that support socio-technical transition processes by bridging structural deficiencies in a transitioning domain. Previous research has identified what roles transition intermediaries perform and how. However, while transitioning domains are by definition in a state of change, the dynamics of transition intermediaries have hardly been studied. Therefore, we explore what mechanisms are driving change in transition-supportive roles of intermediaries, and what kind of conditions enable an intermediary to be dynamically adaptive in supporting a transitioning domain. These questions are addressed in a longitudinal case study of a major European intermediary in sustainable energy. We find this intermediary changed its transition support activities as a result of the frontline staff continually exploring the needs of transition stakeholders and designing new value offerings in response. These role dynamics are enabled by a structure where the policy principal delegates the choice of support activity and external accountability to the intermediary, which organizes itself in a customer-oriented manner. As such, we conclude that the dynamics in intermediaries' transition activities arise from the interplay between policy mandate, organizational structure/design and staff agency.

### 1. Introduction

Collaboration between actors is a key condition for accomplishing transitions in socio-technical domains, such as energy, mobility, or food. In the uncertain and dynamic conditions of a transition, however, establishing and running successful collaborations is often hampered by distrust, lack of previous ties, conflicting visions, and diversity in the technological and organizational backgrounds of the actors involved [1]. Transition intermediaries are actors that are established to bridge these and other structural deficiencies in transition processes, by facilitating the interactions and support needs of other actors in a transitioning domain [2]. Various studies have identified the roles that transition intermediaries perform in support of transitions [3–8], including creating and facilitating networks, investing in new businesses, and developing human resources for specific transition pathways. In previous research, there have also been cues about adaptive behavior in intermediaries. Studies have found that ecologies of intermediaries can change during the course of a transition and that, over time, some intermediaries can cease to act as one [9,10]. Furthermore, transition intermediaries have been noted to change their roles over time and fulfil them “rather fluidly as a response to their dynamic

context and internal learning process” [11]. Kivimaa et al. [12] also suggest that intermediaries, in order to manage conflicts and overcome confusion about their own roles, can reposition themselves over time.

However, research has yet to focus on what we refer to as ‘dynamism’ of an intermediary, that is, understanding how and why individual transition intermediaries develop and change their transition-supportive activities over time; and correspondingly, how to design an intermediary and its governance in a way that provides optimal support to a transition in any given phase of the transition. Meanwhile, many intermediaries operate as policy levers in transition support. Therefore, knowledge of how to improve an individual intermediary’s temporal efficacy would be highly valuable, stressing the importance of better understanding the specific conditions and mechanisms of change. Correspondingly, we raise the following research question: *Under what conditions and how do policy-affiliated transition intermediaries change their transition-supportive activities?*

We performed a longitudinal exploratory case study (spanning 2011–2017) of a major transition intermediary (henceforth: TrInt) in the European sustainable energy landscape – involving 45 interviews and the analysis of over 460 archival materials. To inductively identify the mechanisms and enablers of intermediary dynamism as well as inform a future research agenda on these topics, we use TrInt as a paradigmatic

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**Abbreviations:**

CEO	Chief Executive Officer
EU	European Union
NSD	New Service Development
PhD	Doctor of Philosophy
SME	Small and medium-sized enterprises
TrInt	Transition Intermediary (referring to the investigated case organization)

case [13]; this case was selected because of its origin in a policy intervention by the European Union, its international scope, and the substantial diversification of its activities and engaged stakeholders over time.

Our findings serve to contribute to the literature on transition intermediaries and innovation policy by developing theory on *how* and *under what conditions* intermediation activities change over time. First, we find that intermediaries can create significant complementarities between the transition-supportive roles that they perform (e.g., configuring and aligning interests, technology assessment and evaluation, investment in new businesses, etc.) [5]. Second, we articulate the mechanisms by which the intermediary changes its transition-supportive activities. Third, we explain how policy governance, intermediary management and operational activities together enable the intermediary to continually re-couple itself to a transition domain. These findings also inform a future research agenda for investigating policy-affiliated transition intermediaries.

**2. Transitions and intermediaries**

To effectively deal with major environmental issues, societies need to transform across their systems of production and consumption – that is, *transition* to more sustainable socio-technical configurations [14–16]. Achieving a large-scale transformation of a socio-technical system is, however, very challenging. An arsenal of transition research has conceptualized and empirically demonstrated how incumbent socio-technical configurations are deeply embedded in socio-technical regimes (referring to dominant ‘rules’ embedded in institutions and infrastructures), which are reproduced by incumbent networks of actors that resist change because of routinized behavior and vested interest in dominant designs and infrastructures [17]. New innovations (e.g., new technologies, products and services), emerging in so-called socio-technical niches, require strategic nurturing and empowerment as well as integration into larger systems capable of challenging the present regime [18]. A key issue in this process is that upcoming innovations are initially underdeveloped, more expensive and less reliable compared to the vested socio-technical configurations they are assumed to replace [18]. Furthermore, in organizing activities toward a transition, a diverse set of actors, including firms, research organizations, policymakers, investors and users/consumers have to reinvent the way they operate, collaborate and innovate [3]. Emerging socio-technical configurations thus experience structural, technological, commercial, as well as organizational challenges.

In this study, we focus on one prominent type of (policy) intervention toward overcoming these challenges, namely the *transition intermediary* [3,5,6,19,20]. We define transition intermediaries, following [8], as “actors and platforms that positively influence sustainability transition processes by linking actors and activities, and their related skills and resources, or by connecting transition visions and demands of networks of actors with existing regimes in order to create momentum for socio-technical system change, to create new collaborations within and across niche technologies, ideas and markets, and to disrupt dominant unsustainable socio-technical configurations.” As such, in comparison to

the more generic conceptualization of innovation intermediaries [21], transition intermediation entails a considerable effort facilitating structural change toward a (desirable) future socio-technical system configuration.

Previous work in this area suggests such support creates significant value for at least two reasons. First, in order to bridge the competitiveness gap between old and new technologies, *individual development initiatives of the latter require strategic* support [22]. Here, intermediaries can perform activities that are difficult to undertake for each initiative alone, such as gaining access to funding, lobbying, or steering human resource development [4].

Second, some activities toward furthering a new socio-technical configuration are, by nature, *aggregate level activities* [23]: for example, the building and maintaining of networks that connect the different stakeholders of the new configurations [24], to external actors such as funding and legislative bodies [25], and to regime structures [26,27]. While vital to the development of new system configurations, these activities are typically not in the domain of any particular innovator. Neither can they be assumed to emerge without dedicated support.

Indeed, intermediaries appear to be valuable to the creation and dissemination of new socio-technical configurations [5,26,27]. Correspondingly, previous studies have explored the different flavors of intermediaries across different industrial and institutional contexts [3–6, 28,29] and the mechanisms that complement or conflict each other in connecting specific intermediation activities [30]. By synthesizing various branches of transition studies, Kivimaa [5] devised and empirically validated a typology of transition intermediary roles (Table 1).

Subsequent work has shown that a particular context is typically populated by several (transition) intermediaries with different competencies and business models [30]. As such, one can speak of ‘ecologies of intermediaries’ in which different intermediaries perform different subsets of roles: some of which are complementary, some others competitive [4,8,9,31]. In characterizing ecologies of intermediaries, various studies [4,9,10] also observed that, over time, some intermediaries perish and become replaced by others. As such, at the level

**Table 1**  
A typology of intermediary roles [5].

Articulation of expectations and visions	Building social networks	Learning processes and exploration at multiple dimensions	Other
- Articulation of needs, expectations and requirements (A1)	- Creation and facilitation of new networks (N1)	- Knowledge gathering, processing, generation and combination (L1)	- Arbitration based on neutrality and trust (O1)
- Strategy development (A2)	- Gatekeeping and brokering (N2)	- Technology assessment and evaluation (L2)	- (Long-term) project design, management and evaluation (O2)
- Acceleration of the application and commercialization of new technologies (A3)	- Configuring and aligning interests (N3)	- Prototyping and piloting (L3)	- Policy implementation (O3)
- Advancement of sustainability aims (A4)	- Managing financial resources - finding potential funding and funding activities (N4)	- Investment in new businesses (L4)	- Accreditation and standard setting (O4)
	- Identification and management of human resource needs (Skills) (N5)	- Communication and dissemination of knowledge (L5)	- Creating new jobs (O5)
		- Education and training (L6)	
		- Provision of advice and support (L7)	
		- Creating conditions for learning-by-doing and using (L8)	

of the entire ecology, some of the dynamics of transition-supporting intermediaries are known. Research has also observed that intermediaries can change their roles over time, and thus reposition themselves in the face of the unfolding transition [11,12].

However, with previous research adopting a relatively short temporal scope with limited attention for internal dynamics [4,6,32,33], little is known about how and why individual intermediaries exhibit dynamism in their activities. This is a major limitation because transitioning domains are by definition in a state of change, suggesting that intermediaries can only become effective instruments in transition policy portfolios [34,35] if they are studied and designed as dynamic systems. Furthermore, empirical studies have thus far focused on the roles performed by intermediaries, resulting in a lack of knowledge on how transition intermediaries are governed and set up as *organizational structures* that develop and perform these roles over time [8]. This paper addresses these shortcomings in earlier work.

### 3. Material and methods

To enable a deep empirical exploration, we performed a longitudinal study of the intermediary TrInt, including a total of eighteen case studies of individual service development instances [36]. TrInt is a major intermediary in the area of sustainable energy, established as a public-private partnership that is funded partly by the European Union (EU) and partly by annual partnership contributions by a wide range of industrial stakeholders. Following the definition adopted from Ref. [8], we considered TrInt as an instance of a transition intermediary for three reasons. First, its mission was to contribute to a transition toward a sustainable energy future for Europe, in particular by integrating and enhancing the knowledge triangle of industry, research and education. To fulfil that mission, TrInt facilitated network building and collaborations among hundreds of energy domain stakeholders. Second, when interviewing representatives of TrInt, we noted that supporting the European energy transition was consistently mentioned as a motivation for action on behalf of TrInt at both the managerial and operational level. Third, the EU has explicitly mandated TrInt to support promising innovations across *different sustainable energy technology areas*, implying a systems approach involving multiple technologies and markets.

For this study, the TrInt case features a highly relevant context in two ways. First, we adopt a longitudinal view on the evolution of this intermediary, providing an opportunity to observe how its activities changed over time. Second, TrInt is an intermediary established as a deliberate policy intervention: it was created with the specific mandate from both public and private stakeholders to support innovation in sustainable energy [10]. Accordingly, the case provides opportunities for developing a deep understanding of the governance and management of transition intermediaries as policy instruments.

For the TrInt study, we collected data via interviews, archival materials and participant observations, spanning the period of 2011–2017. As primary data sources, we conducted a total of 45 semi-structured interviews in the period from June 2013 to July 2017, in five different locations where TrInt operates. In selecting informants, a key heuristic arose from the early observation that TrInt packages its support activities into distinct service offerings; notably, the term ‘service’ here is not restricted to a transaction with customers.<sup>1</sup> Accordingly, based on a preliminary list of TrInt’s services, the aim was to invite for each TrInt service at least one interviewee with first-hand experience in developing

or providing the particular service (see Table 2). For most services, we were able to reduce single-respondent bias by triangulating across multiple interviewees [37]. Furthermore, interview transcripts were supplemented with archival materials in the form of minutes of supervisory and executive board meetings, annual business plans, internal correspondence, and external communication materials. A total of 463 documents were collected and analyzed, spanning over 4000 pages. This longitudinal research design (across four years) serves to study the mechanisms underlying the dynamics in transition support activities in real-time, thereby also limiting retrospective bias [38].

For conducting the interviews, we developed a semi-structured interview protocol including three major blocks of questions. Firstly, given that TrInt structured its activities around specific services, we developed a set of questions about the development and provision of services, synthesized from the service development framework of Froehle and Roth [39]. For each service, we inquired about: (a) the description of the service, (b) the motivation for developing the service, (c) the choice of people responsible for developing the service, (d) the process and timeline of developing the service, (e) connections of the service with the other services of TrInt, (f) involved and impacted stakeholders (both internal and external), (g) the impact of the service to the role of TrInt in the European energy landscape, and (h) the (intended) impact of the service to the energy transition.

Secondly, we inquired about the organizational and governance conditions surrounding service development in TrInt at the level of each particular service, including (i) the origin of the mandate for developing

**Table 2**

Interviews per each individual service in the portfolio (including repeat interviews with some informants, sequenced according to the clusters in Appendix 3).

Service description	Interviews	Profile of informants
1. Early-stage venture support	14 interviews	Four location managers <sup>1</sup> ; five supported entrepreneurs; three venturing officers
2. Innovation project support for ventures	7 interviews	Two location managers; technology officer; project manager; venturing officer
3. Scaling support for ventures	2 interviews	Two location managers
4. Due diligence on entrepreneurial teams	1 interview	Service manager
5. Industrialization support	2 interviews	Service manager; team member
6. Innovation project support	11 interviews	Four location managers; two project managers; technology officer; supported entrepreneur
7. Organizational culture assessment	1 interview	Service manager
8. Corporate innovation support	7 interviews	Two location managers; service manager; two team members
9. New business concepts competition	2 interviews	Service manager; team member
10. Talent matching	2 interviews	Three education officers
11. Master programs	3 interviews	Three education officers
12. PhD program	2 interviews	Two education officers
13. (Online) community	1 interview	Service manager
14. Matchmaking events	4 interviews	Two location managers; supported entrepreneur
15. International networking event	3 interviews	Two location managers; supported entrepreneur
16. Thematic reports	2 interviews	Two technology officers
17. New technology impact estimation	2 interviews	Technology officer; service manager
18. Initial market development	4 interviews	Service manager; technology officer; location manager; project manager

<sup>1</sup> A location manager is the CEO of a TrInt office in a particular geographic area, such as Scandinavia.

<sup>1</sup> In identifying any separate service in TrInt, we assumed the following two conditions: (a) a service has a distinctive value proposition oriented to external stakeholders (i.e., offerings for internal users were excluded) that may be provided free of charge, and (b) a service has a distinct title and a commonly acknowledged description within TrInt. For confidentiality reasons, we refer to all services by labels that are indicative of their nature but differ from their official labels in TrInt.

each service, (ii) the accompanying budget allocation and conditions, (iii) oversight of the service development process by TrInt managers, and (iv) any links the service development had with the overall governance of TrInt. Thirdly, in case of interviewees holding managerial positions (i.e., five location managers), we further inquired about how the overall governance over the service portfolio and the service development process at TrInt was performed.

Building on data from question blocks one and two, triangulated with document analysis performed in NVivo along the categories a-h and i-iv defined above, we composed an individual service development narrative for each of the services of TrInt. The resulting narratives were then coded using the framework of intermediary roles [5], simultaneously distinguishing the specific roles of transition intermediation and the stakeholder engagement in accomplishing these roles as featured in each service. The purpose of this coding effort regarding our two research questions was to establish a standardized indicator of the level of dynamism within and across services; as well as to identify any patterns in how the intermediary creates value to stakeholders across services.

In a parallel data analysis effort, we explored the governance and organizational conditions for designing new services in TrInt. Here, we used the second and third block of interview data and archival materials, to code the respective sections for a separate narrative about the conditions for new service development and service portfolio composition at TrInt.

#### 4. Dynamism in services to stakeholders

The empirical analysis spans, with one exception, all services identified in the TrInt service portfolio. The inception of the services ranges from before the period researched (i.e., 2011), to being in a prototype stage at the end of the research period in July 2017. In particular, the portfolio of TrInt in 2011 (outlined in Appendix 1) included four distinct services which engaged four main classes of external stakeholders: ventures, SMEs, research organizations, and university students. Over time, a total of 14 novel services were added, engaging extant stakeholder classes in new ways or addressing two new stakeholders as explicit targets of services: investors and corporations. In Appendix 1 (for 2011) and Appendix 3 (for 2017), the services in the TrInt portfolio have been coded with regard to the transition-supportive roles toward the six stakeholder classes. In Appendix 2, each included service is briefly described. The following subsections serve to explore how and why the transition-supportive role combinations of TrInt evolved over time.

##### 4.1. Facilitating ventures and investors

Throughout the period studied, sustainable energy ventures were one of the key stakeholder classes for TrInt. A location manager explained: “[Supporting ventures] is particularly important in the field of energy. Traditionally, energy is dominated by big players. So, a small startup has a huge challenge. Not only to prove that their idea is good, but also to convince why should a multi-billion utility buy from a small company ... There you need muscles ... [TrInt] can be that muscle.”

In 2011, TrInt provided one distinct service toward that end: early-stage venture support (#1 in Appendix 1). A central aim of TrInt here was to breed new energy ventures that commercialize sustainable technologies (A3) and create jobs (O5). Both aims were directly related to TrInt’s policy mandate (A4, O3). The service frequently involved an investment by TrInt in the venture (L4), which then mostly operated as an enabler for the venture to survive and engage in extensive learning-by-doing (L8). As the CEO of TrInt put it, “Our business model is not to give just money. But to give services ... and also a bit of money.”

In non-monetary support, TrInt focused on supporting individuals or entrepreneurial teams mainly in the form of entrepreneurial training (L6), extensive advice (L7) and building the network of potential

partners around the venture (N1). All of these served to empower the teams to build their own individual path to success. The service may also include instances of arbitration (O1), managing human resource needs (N5), gatekeeping and brokering (N2), and support to finding additional funds (N4). However, which roles are accomplished and how these roles are combined in the service was dependent on the need of a venture at any certain moment, which suggests TrInt was rather flexible in the embodiment of different roles within the service.

At the same time, in its original composition in 2011, the support program for early-stage ventures appeared to have two significant shortcomings. First, as a location manager described: “If you have an idea ... it always needs development inside the company ... You still need focused money to develop your offer. The [early-stage support program] is great for advice and contacts, but you still need to do technical development.” That is, the investment of TrInt in each venture was often seen as insufficient, and many ventures thus struggled to develop and complete a physical prototype (L3), which in the case of energy applications is often costly. Second, with a focus on early-stage ventures, the program lacked both financial and advisory scope to provide support for scaling up. As such, even though TrInt was able to systematically breed new ventures, their impact in terms of market-readiness was perceived as sub-optimal. As result, TrInt explored the development of several new services.

One of these services (scaling support: #3 in Appendices 2 and 3) was developed, starting in 2013, as a “next step after [early-stage venture support] to small companies that have been operating for some years and are now willing to grow and to diversify to new business lines, or to become international” (location manager). Within this service, TrInt would still be able to invest in the venture (L3), but would often serve as a broker for raising external funds from investors (N2). Brokering was also an important part of the service via matchmaking that TrInt organized in a targeted way with their network partners in selected (future) markets (N1) for the ventures. In accomplishing this service, the European scope of TrInt was thus particularly useful.

The second new service was a dedicated service created in response to “the question of start-ups to have money for building a prototype” (location manager). In particular, using the innovation project support service (#7, see below) as a base, TrInt designed a support scheme that would bridge the product development funding gap for ventures. The resulting innovation project support for ventures (see Appendix 2, service #2) was thus one that created a pathway between the offerings of services #1 and #6, providing “a way to speed up the step from business creation to innovation ...” (venturing officer).

Meanwhile, a growing number of TrInt staff members felt that a rigorous methodology to assess the strength of applicants for TrInt support was needed, particularly with regard to the entrepreneurial competencies of venture teams. A suitable methodology would be instrumental in making better decisions about whether to accept a certain venture for support (internal advice). Furthermore, it would tailor the subsequent support program to the individual needs of the venture (L7). Correspondingly, in 2012 TrInt started putting together a service of due diligence on entrepreneurial teams (#4), and simultaneously explored the need of such a service in the venture capital community in sustainable energy. In particular, “after we got positive initial feedback, we selected [one of the biggest sustainable energy VC firms] and did a pilot with them to refine the tool ... Now, every time they do an investment, they call us first” (service manager). As a result, #4 TrInt positioned itself, by 2017, as the standard for team assessment in the sustainable energy industry (A1; O4). The service connected the roles of giving advice to investors on whether and how to support a venture (L7) and feedback to ventures themselves about their developmental needs (L7). This is also the only service in the TrInt portfolio that explicitly targeted investors as main stakeholders.

#### 4.2. Facilitating SMEs and research organizations

Throughout the period under study, a central service in the TrInt portfolio (by share in annual budget) was innovation project support (#6 in Appendix 1). The focus in this service was to facilitate the development of new products/services based on innovative sustainable energy technologies. As such, the primary role embodied in this service was the acceleration of the application and commercialization of new technologies (role A3). The two main stakeholders engaged in this acceleration were SMEs and research organizations, although depending on the particular project, engagement from ventures, corporations and students would also be possible.

The service assumed that applications for support were made by pre-established partnerships (as opposed to individual organizations). Toward that end, TrInt facilitated the creation of new networks (N1), an activity which often benefitted from an explicit search and brokerage effort by TrInt (N2). Once a promising partnership emerged, TrInt further facilitated the alignment of the actors in designing, managing and evaluating a project (O2), involving also formal technology assessment (L2). As another condition for receiving support, each innovation project had to be affiliated with the thematically defined expectations for the respective technology area. Sculpting and updating such expectations in the form of a technology roadmap (A2), as a frame of reference for innovation activities, was thus a key means by which TrInt articulated needs, expectations and requirements (A1) toward enacting policy in sustainable energy (O3).

Once a partnership was established and an innovation project formulated, further support might be granted by TrInt in the form of an investment (against a projected return) toward accomplishing the project (N4). Meanwhile, funding was also not the only type of support provided: TrInt also advised (L7) the partners by non-monetary means, such as supporting the development of intellectual property strategy, market research, or matching the project to potential customers (N2). In the course of executing the project, the stakeholders themselves would heavily engage in learning-by-doing activities (L8), including prototyping and piloting (L3). Innovation projects served to create new jobs in the industry (O5), and in case any issues emerged between the project partners, TrInt could serve as an arbiter (O1) to keep the project on track. This service is also the only service of TrInt that targets research organizations as a main stakeholder, although they are otherwise engaged in other services (see appendix 3).

Upon requests from ventures that had some success in niche markets, TrInt initiated the development of an industrialization support service (#5) early 2017, in order to systematically bring down the price of new energy products and thus move from niches to mass market success. The service manager explained it as follows: "Industrialization is the final step ... As a result, the energy efficiency in Europe will improve more than some small company only selling a couple of units of their products ... If you don't raise this phase in growth, all the previous ones will be mis-investments." With the service still being developed mid-2017, the final service composition remained open, but initial explorations indicated a need to focus on a combination of brokering between the ventures/SMEs, investors and other strong commercialization partners (N2); and advisory services concerning production set-up, supply chain and operations management (L7). Additional investments in these firms were likely needed as well (L4), but TrInt aimed here to broker (N2) in raising additional capital (N4) from external sources (investors) rather than invest itself.

A recurrent shortcoming in supporting innovation project, noted by TrInt staff, was that many organizations were often not culturally ready to engage in open innovation initiatives with outside parties. In response, early 2016 TrInt initiated the development of a workshop-based service to assess and advise (L7) both SMEs and corporations concerning the innovativeness of their organizational culture (service #7). By accomplishing that role, TrInt sought to contribute to the human resource development in energy firms (N5).

#### 4.3. Facilitating corporations

While corporations were involved in TrInt services #1, #3 and #6 as either project partners or clients to ventures in the period 2011–2014, TrInt did not offer any services to corporations as the main stakeholder. In 2014, several corporations explicitly requested support from TrInt. A location manager explained: "The trigger was the question from a strategy meeting with our corporate shareholders. [They said that] incremental innovation we can do ourselves, but please come with a program where you can help us with radical innovation". Receiving this signal, TrInt designed a tailored program offered to energy corporations in developing new sustainable business via collaborative innovation. In doing so, the corporation would be matched with other stakeholders (ventures, SMEs, researchers) from the TrInt network (N1) to develop a common vision (A2, N3) on the future development paths within a societal domain, such as housing. The program subsequently facilitated a process of innovation focused on integrating the complementary technologies/products/services of many organizations in new transition offerings. Brokering (N2) the different parties was central in accomplishing this, while the specific approach adopted could vary significantly from case to another. In different instances of the service, TrInt's support focused on, for instance (a) organizing innovation challenges (accomplishing roles L1, L2, L5, L7 and L8) that lead to collaborative innovation projects (A3, N4, O2); or (b) performing business development activities (N1, N2, N3, L1, L2, L5, L7 and L8) leading to the set-up and investment in new businesses (N4, L4); or (c) organizing alignment workshops toward new network ties (N1, N2, N3) that would facilitate future collaborations between various parties. Furthermore, the service involves support (L7) regarding organizational issues around innovation management.

Brokering (N2) was also pivotal to another TrInt service, which focused on connecting corporations (or occasionally SMEs) to upcoming talent from TrInt's educational programs (see below) in the context of new business concept competitions (service #9). In such a competition, organized together with a specific corporation, students would propose and develop new sustainable energy business concepts for this corporation, serving as new options for the corporation's product/service portfolio (L7). For the students, a business concept competition was an educational experience involving training and coaching by the company (L6, L7) as well as structurally developing ideas for what may become a real business (L8). From a human resource point of view (N5), both sides appeared to benefit from the connections made between corporations and upcoming talent.

Finally, in accommodating the interest of a substantial pool of students and alumni from TrInt's educational programs (see below), TrInt started in 2017 with offering a talent matching service to corporations/SMEs. The core role accomplished with this service was gatekeeping and brokering (N2) candidates with particular skill sets to established firms for internships, graduation projects and jobs. Moreover, engaging with corporations and SMEs provided feedback to the educational programs of TrInt as well as articulated expectations (A1) on the skills that the industry desired from its future employees (N5).

#### 4.4. Facilitating (future) engineers

Engaging the future workforce in acting toward the energy transition remained a substantial part of the TrInt service portfolio throughout the period studied. The two main vehicles developed for this purpose were extra-curricular educational and personal development programs for master students (service #11) and PhD researchers (#12). The CEO of TrInt: "We are trying to create this elite of game changers that will be wired differently ... They are the ones changing the game in sustainable energy." As such, most of the entrants to these programs were engineering students, who were educated (L6) in practice-oriented courses on sustainable energy technologies and entrepreneurship (L8). A key aim for TrInt here was to breed a substantial number of future engineers

that would share a strong belief in cleaner technologies and (corporate) entrepreneurship as a mode of action to change the world (N5). In steering these programs, TrInt relied on input from the human resource needs of the industry (A1, N5), whilst guiding universities and research centers to develop appropriate courses toward these needs (A1). The talent pool created in this manner provided the basis of several new services (e.g., #10, #11, #14) for other stakeholders.

#### 4.5. Facilitating several stakeholders simultaneously

In addition to substantially growing the total number of services, a key difference between the TrInt portfolios in 2011 and 2017 is the addition of services with a transition-supportive profile toward all or most of the stakeholders simultaneously. We identified six of such services (#13–18), all of which featured significant complementarities with other TrInt services.

Two of these services, the matchmaking event (#14) and the (annual) international networking event (#15), were created respectively in 2012 and 2013 to facilitate the creation of new ties among the different stakeholders of the energy domain (N1), ideally leading to new opportunities for all parties. In the case of service #14, an explicit format was used, including formal evaluation of each other (L2) and a series of facilitated matchmaking episodes (N2). In service #15, the network facilitation role was more implicit, arising mostly from the involvement of a substantial number of participants (over 650 in 2016) and the use of a ‘trade fair’ event for new energy technologies/products/services. At the same time, this event served as a major international industry forum for sustainable energy, including a conference where industrial participants shared their expectations (A1) on a number of topics, including technological and market developments, human resource needs, and legislative issues (A2, N5).

Another TrInt service that engaged stakeholders from all classes was the release of thematic reports (#16). With the first report released in 2014, “the objective we had was thought leadership ... it’s showing what we know and that we know what we are doing” (technology officer). As such, the aim of releasing reports in various technology areas was driven by the aim to increase TrInt’s legitimacy and centrality in the sustainable energy domain. However, in accomplishing that goal, the quality of gathering, processing and disseminating knowledge (L1, L5) would have to be very high, which is why a thematic report could serve as an effective means to align expectations (A1) on future technological developments in a particular thematic field. Furthermore, as a technology officer explains “as we received such high-level interest, we decided to take the cost models [in the report] and to put them to web format.” This became the basis for service #17, which allowed innovators to accurately estimate the impact of their technological invention on the cost of energy (L2). With that, TrInt created a standard (O4) that various stakeholders could use as a reference framework to calculate the impact of a certain technology.

Building heavily on its educational programs, TrInt initiated a formal community in 2015 to unite various change agents in sustainable energy. An alumnus of TrInt’s master school, later serving as the community manager, explained: “While being a student on the program, I got to see the potential of connecting the students and the alumni ... in a certain structure, better than just if they meet randomly. [The CEO of TrInt] liked that idea, but actually offered me to connect not only the educational part, but all the people in the whole TrInt network.”

As such, service #13 was initiated as the platform for networking (N1) and communication (L5) among students and alumni of TrInt, within one larger community that united various location-based groups (both off- and online). Later changes to the service extended this community by including (on invitation) ventures, SMEs and corporations. As such, the activity basis of the community was broadened to feature talent matchmaking (part of service #10); organize offline events such as company-led workshops, lectures and gatherings; and as a forum for advising each other (L7).

Finally, in terms of the number of transition-supportive roles and stakeholders involved, the most elaborate service in the portfolio of TrInt was initial market development (#18). This was a service providing a tailored set of activities necessary to bridge a significant market failure in energy-related application/service markets. Here, TrInt itself acted as an integrator of multiple technologies and business models toward bridging a market gap. The project manager of one such project explained, “[TrInt] puts together a concept ... and starts to build it, and a company around it ... we take all the risk: the technical, the financial, the managerial.” The acceleration of technology commercialization was thus performed simultaneously on a whole range of related innovations (A3), which often originated from the other services of TrInt. The aim was to create a new standard in an energy domain (O4) by means of funding and building an operational service (L4). It involved the generation of a strategy for addressing the market gap (A2), one that would encompass the expectations and requirements (A1) across the providers of necessary technological capabilities (L2). Here a TrInt-governed project team (O2) that typically involved student engineers (N5, O5) would attempt to align the interests (N3) in an emerging network of critical parties (N1) toward execution. The process followed a typical iterative development path characterized by learning-by-doing (L8) and piloting (L3) toward a viable operational business.

## 5. Enablers to dynamism

As is evident, there was significant dynamism in how TrInt supported the six classes of energy transition stakeholders. Over time, TrInt launched more services to accomplish more transition-supportive roles toward a larger number of stakeholders. In this section, we explore in more detail the conditions that enabled TrInt to increase its portfolio of services and transition-supportive roles in a highly diverse manner. These enabling conditions are described at two levels: the organizational level and the policy level.

### 5.1. Organizational level

There appears to be no single formal process in TrInt to gain insights in which services to develop and how to better support stakeholders. Instead, TrInt draws mainly on their staff (and affiliates, such as sub-contracted mentors) to signal, analyze and propose new services, or improvements to existing ones, based on their experience in working directly with the stakeholders. A location manager emphasized the importance of a proactive sense of urgency: “I have very often stated to employees here that our system is finished 70%, so we need to develop 30%. Please do something.” Another location manager noted: “What we see is that our impact to energy transition is limited if we do not continue extending our offers ... we need to respond to market failures.” Impulses to take action can come from different personal routines. For example, a project manager found value in linking departments by “just always trying to be there when other departments have internal meetings to listen to the needs.” A location manager also observed that “we gain insight from quarterly meetings with start-ups.” Similarly, another location manager picked up ideas “purely by being in the market and being responsive to what you hear when you are approached. It’s not very difficult ... It’s only standing on the floor and listening to what you hear.”

Once a staff member identified a need or an opportunity for a new offering, the next step was to raise the idea with either a board member or directly with the CEO. In case of a favorable first assessment, these managers would provide the employee with a small number of resources to create a proposal for a new service development project. A technology officer provided an example: “There was a need identified within a working group in TrInt. One of [the members] then took the lead identifying a key partner and a methodology [for what later became service #17]. He came back to the management with a budget and it was agreed.” If the proposal was deemed valuable and feasible, in the next

phase, the executive board assigned a small team to develop the new service. This team typically involved one, but more often two location managers (to create an early international link), as well as several employees or sub-contracted affiliates.

The task in the development period, which usually lasted 12–18 months, was to further research, design, build and validate the new service with targeted stakeholders. In some cases, this process was relatively straightforward and resulted in a standardized offer. In service #7 for instance, the TrInt development team outsourced an external consultancy agency to develop a methodology for the culture assessment of organizations. That methodology was then converted to a standardized workshop format, which was run several times non-commercially to improve the service based on real-time feedback. Subsequently, the service was integrated in the TrInt portfolio. In another service (#8), the experimentation period featured two vastly different cases of support for corporate innovation, each of which allowed TrInt to experiment with a different set of stakeholder classes and perform a tailored set of transition roles. At a later stage, after several commercial applications, this service appeared to remain highly tailor-made (to corporate clients).

Interviewees serving as team-members in developing a new TrInt service reported a high level of discretion in the development period. In this respect, TrInt’s managers highly appreciated the idea of developing each new service in an iterative manner. On the other hand, each team was expected to thoroughly validate the service within the available time and budget, and arrive at an evidence-based proposal for the executive board.

Such an experimental logic in developing new services greatly benefits from staff with an entrepreneurial orientation. A project manager described the organizational culture as follows: “There is a high-risk appetite in doing different things and exploring new possibilities.” While this might not apply to all employees, “there are quite some people in [TrInt] that have good ideas and don’t hesitate to try to convince their direct manager. Or maybe the CEO directly. And there are resources for such people” (technology officer). Nevertheless, as a location manager explained, the headquarter of TrInt tried to maintain a balance: “If you allow too much freedom, there will be too many unstructured local solutions. All of a sudden you spend too much money.” Thus, new service development teams were also expected to deliver solutions that are valuable and scalable across the various geographic locations of TrInt.

### 5.2. Policy level

Of the total annual budget of TrInt, about 20% originated from the EU, based on an annual business plan. As a project manager explained, “the best way to ensure [that there are resources for your service] is to have the idea included in the annual business plan.” At the EU policy level, this annual planning process was the main arena for communicating about and obtaining (some) control on TrInt’s services. In this process, TrInt had the opportunity to include changes in its services, as long as these complied to its overall purpose and featured some aspect of novelty: “We’ve freedom to develop new vehicles, but we need to report them to [our EU-affiliated governance body] ... So, there are several requirements from our policy governance side, for instance innovativeness ... And when we put it in the business plan, it needs to be logical for us to develop such a service” (location manager).

Thus, it was TrInt’s responsibility toward the policymaker to develop and propose ideas for new services as well as to conduct the analyses and testing that justified the addition of a new service. Evidently, the ongoing development of the service portfolio was restricted by resource boundaries, as observed by a location manager: “Everything we do has

to be supported. For example, you have to help the ventures get through. If you don’t have the time and the manpower to support, then it falls through ... that’s why we need to focus in what services to have.” Accordingly, TrInt management needed to decide how attention was divided between existing services and developing new ones. At a higher level, the EU policy body measured the impact of TrInt on an annual basis, and allocated the budget for the next year based on the impact delivered in the two preceding years.

Fig. 1 provides a summary of the structure of organizing transition support activities, which spans across the policy, managerial and operational layers of the organization. Especially at the interface of the frontline operations and key stakeholders, this structure gives rise to frontline employees dynamically adjusting support activities in search of a fit with the needs of external transition stakeholders.

## 6. Discussion and implications

This paper explores under what conditions and how policy-affiliated transition intermediaries change their transition-supportive activities. We conducted an in-depth case study of a prominent energy transition intermediary TrInt. We found that, over time, TrInt dynamically recoupled itself to the transition by actively designing new services, based on deliberate explorations of the needs of stakeholders; and by attempting to find an optimal configuration for each new service through experimental development with targeted stakeholders. We also found that these change mechanisms were enabled by an organizational design which connects the policy principal, the managerial, and the operational layer of TrInt in a particular way. Specifically, two organizational interfaces apparently need to be aligned for intermediary dynamism to emerge (see Fig. 1): the interface between the policy principal and the intermediary, and the interface between the

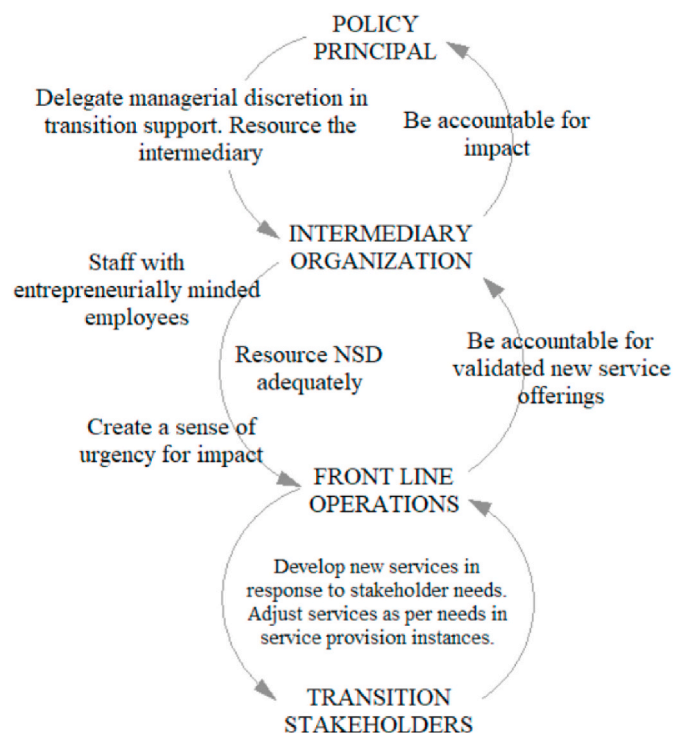


Fig. 1. The structure of organizing transition support activities at TrInt.



intermediary management and operational staff. In this section, we discuss the configuration of these two interfaces as well as the implications of our findings for theory, innovation policy, and future research.

### 6.1. Interface between policy principal and intermediary

The case organization TrInt effectively had a mandate to decide which type of transition-support activities to design and perform, as long as these activities fitted within its general mission. In this regard, agency theory would argue that such a broad mandate might enable TrInt to engage in opportunistic behavior, some of which is likely to contradict or exceed the interests of the policy principal (i.e., the EU) [40,41]. Interestingly, this is precisely what appears to have turned TrInt into a successful intermediary. That is, TrInt had substantial managerial discretion to decide upon specific ways to support its stakeholders. But the policy principal connected that discretion to accountability on the impact and future ambition of its activities, used as the basis for subsequent resource allocations to TrInt. With these incentives to create impact and ambition, it became important for TrInt to not merely provide support activities, but to create substantial value (for stakeholders) in doing so, in order to elicit a growing number of requests for support [42]. Correspondingly, the seemingly loose mandate actually enabled TrInt to make a significant effort in satisfying individual stakeholders as well as growing and diversifying the pool of targeted stakeholders.

As such, a delegation model in which the authority to choose the specific course of action as well as the responsibility for impact are passed from the policy principal to the intermediary is potentially a necessary condition for making the latter dynamically adaptive in its support to a transitioning domain. As a transition unfolds and stakeholder needs evolve, this model both enables and incentivizes the intermediary to respond in a *bottom-up manner*, by dynamically changing its service offerings in search of an improved fit with its stakeholders.

This blueprint for organizing intermediary support fundamentally differs from two other approaches in transition policy studies: (a) the approach in which the needs of the transitioning domain are monitored to facilitate deliberate policy interventions that steer intermediaries in a top-down manner [8]; and (b) the approach in which individual support schemes are informed by a wide-scale visioning (e.g., roadmapping) effort performed across different stakeholder classes [43] or by facilitating bottom-up niche experimentation [16]. Because our study is limited to a single case, it is beyond the scope of this paper to determine which model delivers the highest transformative impact and/or the best use of public resources. However, given that the EU and many nations have been establishing a substantial number of transition intermediaries, it appears critical that they are enabled to continually (re) align their activities to changing external needs – as a cost-efficient approach to provide continued policy support to transitioning domains.

Furthermore, our findings suggest a transition intermediary becomes more effective if it is able to exploit synergies between its services, leverage its roles, and take advantage of an established collaboration network. These conditions take considerable time and effort to produce, and appear not to transfer well across the boundaries of different intermediaries. Transition intermediaries can thus be thought of as (very) long-term policy interventions, which makes it particularly important that these organizations develop the capability to dynamically re-profile and adapt themselves. Since TrInt has been successful in extending its support across several different niches at different stages of maturity, the aforementioned dynamic capability to re-couple to a domain may constitute a major driver of sustaining an intermediary's relevance, also across different development phases of the technological niche(s) they

are affiliated to Ref. [10].

Our findings give rise to further research at the interface of policy principals and transition intermediaries. It was beyond the scope of this study to compare the service offerings of TrInt to other available support schemes. By consequence, one important question to be addressed in future work is whether giving substantial managerial discretion to intermediaries raises the hazard of multiple intermediaries developing overlapping support offerings, thereby possibly reducing the efficiency of public resource use. This also implies future studies need to address intermediary ecologies [9], with a particular focus on comparing and evaluating entire delegation configurations across multiple intermediaries—in terms of their complementarities, redundancy, and impact of resource use. Future studies of intermediary ecologies should also seek to identify additional trade-offs in policy-governed intermediaries; for example, the trade-off between establishing fewer, but more broadly scoped and longer-lasting intermediaries versus increasingly specialized (in time and scope) ones.

A central claim in transition studies is that structural resistance in socio-technical domains tends to slow down transition processes [14]. The effect was not observed in the TrInt case per se, but we would hypothesize that the governance model adopted (by the EU) for TrInt may indeed lead the intermediary to focus on the path of least resistance in the transitioning domain, for example by focusing on the commercialization of more mature socio-technical configurations at the expense of more radical early-stage ones. Consequently, one could argue that responsive and flexible intermediaries may, over time, increasingly distance themselves from their overall transition-support mission. Future research can scrutinize and assess this potential effect.

### 6.2. Interface of management and operations

In uncovering the mechanisms leading to intermediary dynamism, we explored how TrInt operationalizes the mandate received from the policy principal. Here, we found that managers staffed the frontline of the intermediary with entrepreneurially oriented personnel, capable of sensing new needs arising among stakeholders. TrInt then encouraged researching stakeholder needs at a deeper level and (potentially) developing service offerings in response. When perceived as potentially impactful, these service development efforts were adequately resourced. But TrInt's management also required any new service to be well-validated in terms of value (for stakeholders) and scalability. As such, the service development teams were motivated to adopt an iterative process involving experimental interactions with stakeholders in (increasingly mature) service provision situations. Overall, these processes and underlying conditions of service development appear to be similar to best practices in business organizations [44].

A similar insight arises regarding how intermediaries make choices about which transition-supportive roles to embed in a service [8]. Among the roles previously identified [5], more than one alternative pathway for stakeholder support often exists. For example, an intermediary can choose to fund stakeholders directly (L4) or to mediate the funding of others (N4). The choice of role configurations is to some extent determined by available resources, but TrInt also deliberately tested (potential) role combinations to determine which would generate the highest value. Furthermore, some of these services required a level of customizability, in which support roles became embedded in each instance of service provision (e.g., venture support) and a standard set of needs shared by multiple stakeholders was absent. As such, with regard to staff capabilities and flexibility of offerings, intermediaries need to be highly professional and adaptive in order to be able to maximize value for their stakeholders.

This finding also invites future work on viewing transition intermediaries as *organizations*, implying they are subject to (among others) choices regarding structure, staffing, incentives, processes, and organizational culture [45], which, combined, influence organizational effectiveness.

**7. Conclusion**

In various attempts to scale up the energy transition, intermediaries have become a prominent component in the policy mix of transition support. But allocating public resources to intermediaries comes at significant opportunity cost, which raises the bar for intermediaries to deliver actual impact. In a continuously changing transition environment, intermediary actors need to be (come) adaptive and responsive to the changing needs of the transition stakeholders they serve.

In this study, we explored the mechanisms and conditions by which a major policy-affiliated intermediary has been able to reconfigure its service portfolio to continually respond to the needs of transition stakeholders. Most notably, the ability of an intermediary to re-couple itself to a transitioning domain apparently assumes a particular set-up of balancing a flexible mandate with accountability between the policy principal, the management, and the operational staff of the intermediary. This delegation model enables the intermediary to internally structure itself in a stakeholder-oriented way, leading to continual bottom-up service innovation.

Accordingly, transition intermediaries may indeed play a crucial role in enacting transition policy in both international and national arenas. However, to actually deliver on their transitional promise, it is important to allow these organizations to make their own decisions on the portfolio of support services offered. Only over a substantial period of time can an intermediary learn to form strong relationships with transition stakeholders, converge to specific configurations of impactful activities, and develop significant synergies between activities.

**Credit author statement**

Madis Talmar: Conceptualization; Investigation; Data curation; Formal analysis; Writing – original draft; Visualization. Bob Walrave: Conceptualization; Funding acquisition; Methodology; Formal analysis; Writing – review & editing. Rob Raven: Conceptualization; Writing – review & editing. Georges Romme: Funding acquisition; Methodology; Writing – review & editing.

**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**Appendix 1**

The initial service portfolio of Trint across engaged stakeholders and intermediary roles in December 2011.

Services	CL			Articulation of expectation & visions (A)			Building social networks (N)			Learning processes and exploration (L)			Other (O)			
	V	I	S	V	I	S	V	I	S	V	I	S	V	I	S	
1. Early stage venture support	A1	A3	A3	N1	N2	N4	N1	N2	N4	L2	L4	L6	L7	L8	O1	O5
6. Innovation project support	M	R	S	N1	N2	N3	N1	N2	N3	L2	L3	L7	L8	L2	L3	L7
11. Master programs	S	S	S	N1	N2	N4	N1	N2	N4	L2	L3	L7	L8	L2	L3	L7
12. PhD program	S	S	S	N1	N2	N5	N1	N2	N5	L2	L3	L7	L8	L2	L3	L7

- transition roles coded according to Ref. [5], see Table 1;  
 - V - ventures, I - investors/financiers, SM - small/medium sized enterprises, C - corporations, R - research organizations; S - students;  
 - indirect or infrequent engagement is represented in brackets;  
 - via the mandate of Trint, A4 and O3 are implicitly embedded into almost all services, and thus omitted;  
 - codes shown in underlined bold express the core focus of each service;  
 - column CL stands for the cluster of main stakeholders engaged in each service.

Appendix 2

Description of TrInt services across the period 2011–2017.

Name of new service	Description of service	Motivation for development	(External) stakeholders involved	Complementarities with other services
1. Early stage venture support	An accelerator program for sustainable energy entrepreneurs. Involves the assessment of business ideas, tailored business services, support in finding external capital and investment by TrInt against a share in the venture. Tailored business services may include for example training, IP and legal consultancy, partner and client matching, access to laboratories, technical expertise and access to networking events. This service was part of the TrInt portfolio at the beginning of the studied period.	Service was present at beginning of period studied	Starting (non-incorporated) entrepreneurs and ventures (as target clients), investors, SMEs and incumbent corporations (as potential partners to the ventures), students (as employees).	Attracts starting entrepreneurs with the possibility to naturally move from early stage support to scaling support (#3) and potentially to #5. Services #14 and #15 serve as platforms to finding customers, investors and partners. Team selection and tailored support is based on service #4. If field of operations is in renewable energy technologies, ventures can take use of service #9. New recruits are frequently graduates of services #11 and #12.
2. Innovation project support for ventures	Providing funding and mentor support to ventures for product development, with focus on technical prototype development. Development started in 2012.	Several portfolio ventures voiced the lack of financial and executive support to prototyping activities. Meanwhile, the innovation project support service format was deemed administratively too burdening for the context of ventures.	Ventures (as target clients), research organizations, investors, SMEs and incumbent corporations (as potential partners to the ventures).	Fulfilling a deficiency in the other venture support programs by TrInt. The service was later incorporated into the venture support programs (#1 and #3) as an optional extra.
3. Scaling support for ventures	A support program for established ventures toward scaling their activities to new business lines, new markets, new customer segments or new production capabilities. Includes tailored business services, support in finding external capital and (occasionally) investment by TrInt against a share in the venture. Development started in 2013.	It was voiced by some ventures and SMEs that the support they need is of different nature than offered by early stage venture support (service #1).	Ventures and SMEs (as target clients), research organizations, investors, SMEs and incumbent corporations (as potential partners to the ventures).	Serves as an extension to service #1, although does not assume the venture to have been affiliated to #1 first. Similar other complementarities as listed for service #1.
4. Due diligence on entrepreneurial teams	An assessment methodology for assessing the strength of a venture team, either toward better informed investment/funding decisions, or toward developing personalized support programs. Development started in 2012.	Developed initially to respond to the internal need to assess venture teams across a wide array of characteristics. Shortly after, it was market tested and proved to be generic also for external investors/funding agencies who became clients of the service.	Ventures and investors (such as business angels, venture capital, accelerators/incubators and governmental programs) as the two sides of the assessment.	Provides input for decision making for all other services that involve team interactions, but in particular for services #1 and #3.
5. Industrialization support	Support strong ventures and SMEs that already have viable sustainable energy products to systematically bring down the cost of these products. The aim is to bridge niche products to mainstream markets. Includes a variety of advisory services and brokering for external capital. Development started beginning of 2017.	Several new energy technology ventures and SMEs voiced that they were struggling to scale up due to their product being too expensive to sell to mass markets. Furthermore, unsuccessful attempts to raise additional capital led the entrepreneurs to claim a lack of scale-up oriented funding in the sustainable energy domain.	Established ventures, SMEs (as target clients), investors (as key enablers to execution), other SMEs and incumbent corporations (as potential partners and customers).	Logical next step to offering services #1, #2 and #3. Once a venture has matured by reaching a viable product, it can receive support in scaling up their production and supply chain capabilities. This is beneficial to TrInt if the venture is already affiliated to them from a previous program.
6. Innovation project support	Support program for international consortia-based innovation projects which aim to commercialize innovative sustainable energy technology in new products/services. The support program entails investments in product development, and a variety of other services such as partner matching, advice on intellectual property, market analysis and customer matching. Guidelines for innovation project teams are set by TrInt in thematically based technology roadmaps, which new projects are expected to affiliate to. This service was part of the TrInt portfolio at the beginning of the studied period.	Service was present at beginning of researched period	Research organizations and SMEs (as supported consortium members), occasionally ventures and corporations. Students frequently run thesis projects or find employment in the service of a particular innovation project.	Takes use of ideas and workforce emerging from services #11 and #12. Services #14 and #15 serve as platforms to finding customers, investors and partners.
7. Organizational culture assessment	A workshop-based service to assess the organizational culture of a company in terms of readiness for collaborative (open) innovation. Enables	Developed initially to respond to the internal need of TrInt to assess potential organization constellations for service #6. Later, it was identified	Incumbent corporations (as target clients), SMEs and research organizations (applying for TrInt support).	Enables TrInt to estimate the potential success of operationalizing collaborations (predominantly) going into service #6 and to strengthen ties

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Name of new service	Description of service	Motivation for development	(External) stakeholders involved	Complementarities with other services
	organizations to gain feedback for self-reflection. Occasionally used for the assessment of organizations for external purposes (e.g., a funding decision). Development started beginning of 2016.	that external stakeholders can benefit from the service as an exercise in self-reflection.		with corporations (for services #8, #9 and #10).
8. Corporate innovation support	Establish strategic partnerships with energy corporations with the purpose of developing radically new business at the interface of TrInt and a corporation. Involve the TrInt network in the development of such businesses toward creating successful collaborations between TrInt network partners and the corporation. Potentially co-fund the resultant business cases. Development started in 2015.	Several corporations requested for a service that is targeted to increasing their innovation capabilities in the transitioning energy landscape, in particular for radically new innovation.	Incumbent energy corporations (as target clients), ventures, SMEs (as integrated into specific new business development initiatives). Occasionally engages also students and researchers (as sources of innovative concepts).	The service creates input into other services: #1, #6 and #18. Existing TrInt portfolio ventures and projects can be integrated into emerging business cases, which then serve as scaling opportunities for these ventures and projects.
9. New business concepts competition	Organizing new business concepts competitions among students on behalf of an industrial partner. As result, the industrial partner can identify new opportunities for products/services, and potential talent. Service development started in 2015.	As part of developing challenge-based education in master programs, several major corporations were first invited to post innovation challenges. Upon the success of these initiatives, a particular major corporation voiced the interest to organize a separate (extra-curricular) challenge competition.	Incumbent corporations and trade associations (as target clients), SMEs as secondary clients, students (as participants).	Connecting master and PhD students as talent to major industry. Scout potential ideas for other services, in particular #1, #6, #8, and #18.
10. Talent matching	Service package offered to corporations/SMEs, granting access to the talent pool of TrInt students and alumni. Service entails the advertising of vacancies in the corporation, access to TrInt (online) community for direct communication with the students and alumni, as well as participation at student events. Service development started in 2016.	Students on TrInt programs frequently articulate the need for internship and graduation thesis positions, as well as for jobs post-graduation. On the other side, several major corporations showed interest for finding new employees, and willingness to pay for their TrInt-supplied education.	Incumbent corporations/SMEs (as target clients) and students/alumni (as supply of talent).	Connecting master and PhD students/alumni from services #11 and #12 as talent to major industry. Receiving feedback for bettering the education programs #11 and #12.
11. Master programs	Educational program for master students with interest in making an impact in sustainable energy. Within the program, students receive courses and a variety of supplementary personal development services (such as coaching, mediation for industry placement during thesis, and international mobility) on top of their regular master education. TrInt maintains several themes of master programs, but each has the underlying aim to complement the standard engineering-oriented education with entrepreneurial skills. This service was part of the TrInt portfolio at the beginning of the studied period.	Service was present at beginning of researched period	Master students (as target clients), ventures/SMEs/corporations (as offering thesis topic opportunities and jobs), research organizations (as developing new courses for the program).	Systematically trains entrepreneurially dispositioned (mostly) engineers as potential contributors to TrInt other services, such as #1, #6, #8, #9, #10, and #18. Master students form a bulk of the community in service #13.
12. PhD program	An educational program toward PhD researchers to complement their normal educational track. Within the program, PhD students receive courses and a variety of supplementary personal development services (such as access to networking events and international mobility). The underlying aim is to incept PhDs with entrepreneurial skills and a clear path to commercializing the technologies emerging from their research activities. This service was part of the	Service was present at beginning of researched period	PhD students (as target clients), ventures/SMEs/corporations (as offering industrial partnerships in research, and/or jobs), research organizations (as developing new courses for the program).	Systematically breeds entrepreneurially dispositioned (mostly) PhD engineers as potential contributors to TrInt other services, such as #1, #6, #8, #9, #10, and #18.

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(continued)

Name of new service	Description of service	Motivation for development	(External) stakeholders involved	Complementarities with other services
13. (Online) community	TrInt portfolio at the beginning of the studied period. An online communication platform to unite the community around TrInt. First aimed to unite the students and alumni, but later incorporated other stakeholders classes as well. The community is a major communication channel for TrInt and facilitates several other services. Development started in 2015.	Developed first based on the signal from the student/alumni community to be formally better connected in order to remain actively involved with peers after graduation. Initial events and online platform demonstrated additional opportunities for integrating also other stakeholder classes.	Students/alumni (as original members), ventures/SMEs/corporations (invited later to extend the community reach).	Within-community communication channel for practically all other TrInt services and for peer-to-peer advice. However, includes dedicated sections for supporting services #9, #10, #11 and #12.
14. Matchmaking event	A methodology (and execution) for organizing networking events in a structured and efficient manner. The purpose of the events is to facilitate collaboration between the different stakeholders to sustainable energy solutions, including ventures, SMEs, incumbents and investors. The event format involves several rounds of organized networking based on peer assessment to pitches. Development started in 2012.	Developed to respond to a need voiced both externally and internally in TrInt that there need to be systematic ways for (locally oriented) matchmaking in the energy industry.	Ventures, SMEs, investors, corporations as potential collaboration partners, policymakers and investors (all target clients).	Serve as a platform to finding customers, investors and partners for projects and ventures affiliated to services #1, #2, #3, #6, and #18.
15. International networking event	Organizing an annual pan-European networking event to connect corporations, ventures, policy-makers and SMEs on sustainable energy. The event also involves a trade fair, a conference and pitching sessions. First took place in 2013.	Developed to respond to a need voiced both externally and internally in TrInt that there need to be systematic ways for international matchmaking in the energy industry.	Incumbent corporations, ventures, investors, SMEs, policymakers, researchers (as target clients).	The service provides a platform for the affiliates of other services (#1, #2, #3, #5, #6, #18) in exhibiting their innovation.
16. Thematic reports	Industry reports stating the present and future developments in various sustainable energy themes, such as solar photovoltaic, wind energy and regulation in electricity markets. The purpose is to align expectations across various stakeholders and delineate particular development pathways toward higher penetration of sustainable energy in Europe. Total six reports published in the period 2014–2017.	Being a network-oriented organization, the individual services and the overall prominence of TrInt in the European energy landscape are heavily dependent on exercising thought leadership. In order to demonstrate that and to invite external organizations to its programs, TrInt started composing thematic reports.	Ventures, SMEs, corporations, investors, legislators, research organizations and students (as target clients).	Meant as support material to the whole network around TrInt. In that capacity complementary to many other services, in particular services #3, #5, #6, #8, #17, #18. Shares the same methodological base as service #17.
17. New technology impact estimation	A modeling methodology (tool) that enables the estimation of energy cost reduction from any specific innovation in renewable energy technologies. As such, the tool allows technologists to demonstrate potential impact of what they are working on, for example to convince funding or cooperation partners. Development started in 2014.	Developed to respond to the internal need of TrInt to (1) measure the potential impact of current and future supported technology-based ventures and projects, and (2) externally demonstrate thought leadership of TrInt. Received positive feedback in both capacities, which led to an externally-oriented service.	Research centers, students (as current main clients of the service), ventures, corporations and industry representatives (as occasional clients).	Enables TrInt to estimate potential value of applicants to services #1, #3 and #6, and to enhance the value of existing portfolio ventures/projects by allowing them to demonstrate their impact. Legitimacy for thought leadership indirectly reinforces all TrInt services.
18. Initial market development	In case there is a market failure around accomplishing specific desirable (transition) products/services, TrInt can internalize the development of such products/services toward building an operational business. When successful operations are achieved, the operation is transferred to an incumbent partner. Development started in 2014.	Opportunities for creating value by complex integration were presented to incumbent organizations in the energy domain, but were considered too risky. TrInt nevertheless considered that accomplishing certain transition products/services is valuable, and decided thus to internalize the development of such.	Ventures and SMEs (as providers of components to be integrated); students (as accomplishing the integration); incumbent corporations (as transfer partners); investors (as potential enablers).	Provides new opportunities for companies affiliated to TrInt via services such as #1, #3, #6. Service #8 can lead to the initiation of an initial market development project.

## Appendix 3

## intermediary roles (July 2017).

The service portfolio of TrInt across engaged stakeholders and

Services/Stk.hold.	CL	Articulation of expectation & visions (A)						Building social networks (N)						Learning processes and exploration (L)						Other (O)								
		V	I	M	C	R	S	V	I	M	C	R	S	V	I	M	C	R	S	V	I	M	C	R	S			
1. Early stage venture support	V	A1 <u>A3</u>						N1 N2 N4 (N5)	(N1) (N2) (N4)	(N1) (N2) (N2)	(N1) (N1) (N2)	(N1) (N2) (N2)	(N2) (N2) (N2)	L2 L3 L4 <u>L6</u> <u>L7</u> L8	(L2) (L4)					O1 <u>O5</u>	(O1)	(O1)	(O1)	(O1)	(O5)			
2. Innovation project support for ventures (not active any more in 2017)	V	<u>A3</u>		(A3)		(A3)		N1 N2 N4	(N1) (N2) (N4)	(N1) (N2) (N4)	(N1) (N2) (N4)	(N1) (N2) (N4)	(N1) (N2) (N4)	L2 <u>L3</u> <u>L4</u> (L6) L7 L8 (L8)	(L2) (L3) (L4) (L6) (L7) (L8)					O1 (O2) (O5)	(O1) (O2) (O5)	(O1) (O2) (O5)	(O1) (O2) (O5)	(O1) (O2) (O5)				
3. Scaling support for ventures	V	A1 A3					<u>N1</u> N2 <u>N4</u> N5	(N1) N2 <u>N4</u>	(N1) (N2) (N2)	(N1) (N2) (N2)	(N1) (N2) (N2)	(N1) (N2) (N5)	L1 L2 L3 L4 L6 <u>L7</u> L8	L2 L4 (L2) (L2)	(L1) (L2)	(L2) (L2)				O1 O5	(O1)	(O1)	(O1)	(O1)	(O5)			
4. Due diligence on entrepreneurial teams	V I	A1	A1	(A1)			N4 N5	N4	(N4) (N5)					<u>L7</u>	<u>L7</u>	(L7)					O1 O4	O1 <u>O4</u>	(O1) (O4)					
6. Industrialization support	V M	<u>A3</u>		<u>A3</u>			N1 <u>N2</u> N3 N4	N1 <u>N2</u> N3 N4	N1 <u>N2</u> N3 (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	L2 (L4) <u>L7</u>	L2 (L4) <u>L7</u>	L2 (L4) <u>L7</u>				O1 (O2) O5	O1 (O2) O5	O1 (O2) O5	(O1) (O2) (O5)	(O1) (O2) (O5)				
8. Innovation project support	M R	(A1) (A3)		A1 <u>A3</u>	(A1) (A3)	A1 <u>A3</u>	(A1) (A3)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(L2) (L3) (L7) (L8)	L2 L3 L7 L8	(L2) (L3) (L7) (L8)	L2 L3 L7 L8	(L2) (L3) (L7) (L8)	(O1) (O2) (O5)		O1 O2 O5	(O1) (O2) (O5)	O1 O2 O5	(O1) O2 O5				
10. Organizational culture assessment	M C																											
12. Corporate innovation support	C V M R	A1 <u>A2</u> A3		A1 <u>A2</u> A3	A1 <u>A2</u> A3	(A1) (A2) (A3)	<u>N1</u> <u>N2</u> N3 N4	<u>N1</u> <u>N2</u> N3 N4	<u>N1</u> <u>N2</u> N3 (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	(N1) (N2) (N3) (N4)	L1 L2 L3 L4 L5 <u>L7</u> L8	L1 L2 L3 L4 L5 <u>L7</u> L8	L1 L2 L3 L4 L5 <u>L7</u> L8	(L1) (L2) (L3) (L4) (L5) (L7) (L8)			O1 O2 O5	O1 O2 O5	O1 O2 O5	(O1) (O2) (O5)					
16. New business concepts competition	C S			(A3)	A3		A3		(N2) (N3) (N5)	<u>N2</u> N3 <u>N5</u>			<u>N2</u> N3 <u>N5</u>		(L2) (L7)	L2 (L7)								L2 L6 L7 <u>L8</u>	(O5) (O5)	(O5)		
18. Talent matching	C S			A1	A1		A1		(N2) (N3) (N5)	<u>N2</u> N3 <u>N5</u>			<u>N2</u> N3 <u>N5</u>											(O1)	O1	O1		
20. Master programs	S			A1	A1	A1	A1	(N1) (N2) (N5)	(N1) (N2) (N5)	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>											<u>L6</u> L7 L8				
21. PhD program	S			A1	A1	A1	A1 <u>A3</u>	(N1) (N2) (N5)	(N1) (N2) (N5)	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>	(N1) (N2) <u>N5</u>											<u>L6</u> L7 L8				
22. (Online) community								(N1) (N5)	<u>N1</u> N2 N5	<u>N1</u> N2 N5	(N1) (N2) N5	(N1) (N2) N5	(N1) (N2) N5	(L5) (L6) (L7)	(L5) (L6) (L7)	(L5) (L6) (L7)							<u>L5</u> <u>L6</u> <u>L7</u>	O1	O1	O1	(O1)	(O1)

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