Driving Transformational Sustainability in a University Through Structural and Academic Innovation: A Case Study of A Public University in Spain

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ABSTRACT

Higher education institutions (HEIs) are increasingly engaged in the urgent and important work involved in the global transition towards sustainable development. They are potentially well suited to address key challenges, being as they are knowledge and talent 'factories'. Beyond their educational mission, HEIs are particularly well placed to convene other actors as well as enable the conscious collision of disciplines in pursuit of solutions. However, academic programs that ostensibly focus on sustainability are in fact too narrow in scope and can stand isolated. The academic custom disciplinary and organizational silos can also exacerbate the intellectual and structural difficulties to fuller immersion in sustainability by the academy. Using a case-study approach, we examine an academic innovation (Master's Program in Strategies and Technologies for Development), and a structural innovation (Innovation and Technology for Development Centre, itdUPM), two discrete change agency initiatives at Universidad Politécnica de Madrid. Going on to explore the interactions between the Master's and itdUPM, the case identifies how the latter structural innovation as a supporting structure enables the development of transformational sustainability at the university-level, generating long-term societal impacts through a transformative learning. Our findings suggest that pan-institutional inter-disciplinary sustainability-oriented programs may serve as a powerful lever for HEIs to contribute to sustainability challenges, representing vehicles for effecting change within an institutional context.

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Nevertheless, academic innovation is considered a necessary condition, but is not sufficient alone. The case shows that the innovation processes must go beyond the borders of educational programs to promote changes in the internal structure of universities and new multi-stakeholder ecosystems. They may furnish learning and research opportunities for students and staff, and income generating activities for universities. However, to keep this "virtuous loop" active at HEIs, innovative intermediate structures such as itdUPM are required to cultivate trust capital and foster value creation.

Key words: structural and academic innovation, partnerships, transformative learning.

INTRODUCTION

Universities and colleges through their endeavors in teaching, research and service are increasingly engaged in the urgent and important work involved in the global transition towards sustainable development (Purcell *et al.,* 2019). Academic and sectoral reports describe compelling accounts of impactful outcomes and examples of systemic change driven by higher education institutions (Filho *et al.*, 2017; Flynn *et al.*, 2017; Haertle *et al.*, 2017; Lozano García *et al.*, 2006; Opoku & Guthrie, 2018; Hugar *et al.,* 2015; Dancz *et al.*, 2017; WEF-GULF & ISCN, 2018). The 2030 Agenda and the Sustainable Development Goals (SDGs) have fast become a point of reference, a shared narrative and a catalyst for this work, leading to the emergence of new initiatives and discussions across the global higher education sector (Kang & Xu, 2018; Owens, 2017).

Higher education institutions (HEIs) are potentially well suited to address key challenges of sustainable development, being as they are knowledge and talent 'factories'. Graduating and educating sustainability-aware people and offering research-led insights to policy makers are two obvious means though which HEIs contribute. Beyond SDG Goal 4, 'Quality Education', universities and colleges can exercise influence across the 17 SDGs and their underlying targets, from poverty reduction to health and environmental sustainability. Indeed, HEIs are particularly well placed to convene other actors involved in sustainable development as well as enable the conscious collision of disciplines in pursuit of solutions. These are both essential to supporting transformation and are explicitly referenced by SDG 17 'Partnerships for the Goals'- (Filho *et al.,* 2017; Hansen & Lehmann 2006; Moreno-Serna *et al.,* 2020).

However, there remain a range of obstacles and barriers, from policy to practice, that hinder the transformational potential of HEIs to effect change within and across the wider stakeholder landscape. It is widely asserted that curriculum offerings and academic programs that ostensibly focus on sustainability are in fact too narrow in scope and can stand isolated from study pathways – whether liberal arts or professional in destination (Ramos *et al.*, 2015; Cottafava *et al.*, 2019). Sustainability as a term may be taken to be relevant to the environment alone, neglecting essential social, economic

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and ethical dimensions. The academic custom and practice of disciplinary and organizational silos can also exacerbate the intellectual and structural difficulties to fuller immersion in sustainability by the academy. Indeed, university structures and incentives rarely accommodate inter-disciplinary and multi-stakeholder collaboration efforts, whether projects or programs (Mataix *et al.,* 2017).

Given the urgency and importance of the existential crises faced by humanity, we need to tackle obstacles to embedding sustainability and leverage the power of universities and colleges fully to deliver against the SDGs. The adoption of a systemic approach or systematic engagement by HEIs has been advocated, this compromises education, research and administration activities and includes a comprehensive suite of actors (Koester *et al.,* 2006). As such, universities need to find new ways through which systemic transformation might be achieved. Many HEIs, including Spanish public universities such as the Universidad Politécnica de Madrid (UPM) used here as a case study, are typically conservative in nature and can present resistance to change related to leadership, management or governance that hinders the development of levers for achieving transformational change. While this belies significant innovation at subject and research levels, the adoption of revolutionary innovation strategies at a whole institutional-level does not seem a feasible pathway given the centrality of academic autonomy and shared governance. As such, new models emergent from the academy are required.

Here, we examine two discrete change agency initiatives at UPM, one an academic innovation, namely the Master's Program in Strategies and Technologies for Development (MSTD), the second, a structural innovation, the Innovation and Technology for Development Centre (itdUPM). The MSTD is a sustainability-focused degree where a rich ecosystem of faculty, students and partner organizations interact around the main issues of the 2030 Agenda. This was a key priming factor for establishing itdUPM, ostensibly an SDG-innovation and partnerships arm of the university. Drawing on Kotter's work (Kotter, 2014), itdUPM is positioned to function as a dual operating system – that is, an organizational model designed to enable the rapid development of new concepts and ideas while operating in concert with the established hierarchy. The conceptual framework underpinning a university-wide engagement with the SDGs has been described (Purcell, 2019; Purcell & Chahine, 2019), noting the way a community of social networks activated around shared purpose can work in concert with the senior management hierarchy (Ezquerra-Lázaro et al., 2021). These models combine the entrepreneurial capability of a network with the organizational efficiency of a traditional hierarchy. The UPM case draws out the main learning insights from the MSTD initiative and captures its transformational impact. Going on to explore the interactions between the Master's and itdUPM, the case identifies how the latter structural innovation as a supporting structure enables the development of transformational sustainability at the university-level.

Overall, the academic and structural exemplars explored here seek to advance our understanding of systemic innovation and ways to mitigate the actual and perceived risks to the status quo presented by new initiatives and programs. In this way, we can gain insights into means to both attenuate

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and honor cultural resistance. The present paper aims to provide a case where the combination of academic innovation (MSTD), structural innovation (itdUPM), and several multi-stakeholder partnerships that emerged through the MSTD-itdUPM interface, create value through societal impact and transformative learning. By analyzing the key elements of the case, we seek to provide practical insights to the SDG-committed HEI community.

The article is organized as follows: next section provides the objectives and the case study methodology; then the main original features of the case are presented; Result's section provides evidence of impact and transformative learning with last section offering key findings and conclusions.

OBJECTIVES

Article's Aim and Scope

The present study examines the academic innovation represented by the MSTD describing how, through the interactions with a structural innovation, the itdUPM, user-led initiatives can drive transformational sustainability in a university setting. The study responds to calls for deeper analysis of academic innovation cases that provide evidence of long-term societal impacts through a transformative learning process. The objectives of the study were threefold:

- To analyze the three pillars of the case, namely: the academic innovation of the MSTD that served to foster a culture of collaborative work across disciplines at UPM; the structural innovations of the itdUPM that reinforced the MSTD, and the way in which both supported the creation of multi-stakeholder partnerships that generated impact in advancing transformational sustainability.
- To articulate the competencies and learning approaches that underpinned the academic innovation of the MSTD that primed the establishment of the itdUPM.
- To gain insights into the value created by societal impacts generated through the aforementioned partnerships.

This work has strong practical implications arrived at through rigorous evaluation. By examining the unique aspects in this case study, we intend to provide valuable insights for other initiatives undertaken by HEIs and other knowledge-led organizations seeking to strengthen their impact.

Methodology

This article adopted a case study methodology, based on the analysis of a variety of data sources that offers rich empirical descriptions of specific instances of a contemporary phenomenon, 'the case' (Yin, 1981). Case studies enable insights into complex cause-effect relationships that can provide useful pointers for addressing major substantive themes in a field (Yin, 1992). As this methodology is also

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useful for theory building (Eisenhardt, 1989), a wide range of fields have used case studies, including particularly education (Yazan, 2015; Yin, 2017), management, supply chain and operations research (Mintzberg & Waters, 1982; Voss *et al.,* 2002) and the study of collaborative initiatives (Stott, 2006).

The MSTD is unique at UPM being an interdisciplinary collaboration that led to the creation of innovative structures within the university (Mataix *et al.,* 2017) and transformative partnerships with external organizations, for example the Alianza Shire initiative which was the first humanitarian multi-stakeholder partnership in Spain (Moreno-Serna *et al.,* 2020). To estimate the impact of the partnerships incubated within the MSTD and the support of itdUPM, the 'theory of change' was used (Brest, 2010). This is a well-grounded framework, used extensively in development programs to better understand and quantify the direct contributions of a project and the indirect attributions of its further impacts (Zwart, 2017). It distinguishes among:

- Outputs: the direct delivery of a project, expressed in concrete products.
- Outcomes: the direct benefits to a targeted community.
- Impacts: the contribution to systemic goals, where there is an indirect attribution.

Regarding the transformative learning practices through the MSTD, the learning outcomes are described using the significant-learning taxonomy proposed by Fink (Fink, 2013). The learning goals defined are aligned with the key competences for sustainable development in higher education identified by Lozano and colleagues (Lozano *et al.,* 2017). The different teaching and learning strategies put in place are also given, being based upon three widely accepted approaches: interdisciplinarity (Cottafava *et al.,* 2019); action-based learning (Lozano *et al.,* 2017), and multi-actor involvement (Iyer-Raniga & Andamon, 2016).

The case study was undertaken between January 2019 and June 2020 and drew on the following sources of information: annual academic reports of MSTD (2018, 2019); self-evaluation reports; direct observation in the field (including attendance at classrooms sessions, final thesis dissertations, meetings of the academic committee of MSTD and participation in workshops); semi-structured interviews with teachers, students, alumni and MSTD partner organizations; key documents associated with the different partnerships activities (including project proposals, agreements, terms of references, contracts, internal regulations and norms, and reports). The statistics on the MSTD presented in the following section refer to the last two academic years and can be accessed online in the institutional UPM's MSTD webpage: (https://www.etsiaab.upm.es/Docencia/Masteres/Especializacion/masteretd).

BOOSTING SOCIETAL IMPACTS AND TRANSFORMATIVE LEARNING FROM THE MSTD

The MSTD began in 2010 as an important milestone in the consolidation of collaboration among UPM faculty who carried out their research on technological solutions to alleviate poverty (access to

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water, energy, telecommunications, basic housing, and food security). The objective of this academic innovation, which took the form of a new program, was threefold:

- To consolidate the teaching offer in the field of sustainability which was, until then, spread across separate subjects in different academic departments with no unifying or shared oversight;
- To create a cadre of next generation scholars and leaders who would be ready to support the research groups committed to work on the fight against poverty and sustainable development;
- To consolidate a culture of collaboration and trust among faculty of different UPM departments and schools.

Soon, for the group of founder faculty, the great potential of interdisciplinary work on sustainability at the UPM began to emerge. In order to place at the heart of the university issues that had occupied a marginal space, faculty involved in the MSTD realized that a structural innovation was needed to support the academic innovation and go beyond its teaching focus. This was the spark for creating the itdUPM, which was established in 2012 with the aim of strengthening relationships among groups, with other University units and with key agents in the City of Madrid and beyond, nationally and internationally.

With more interconnected interdisciplinary research groups created and sustained through the Master's degree and with itdUPM serving as a gateway into UPM for many organizations, opportunities to build multi-stakeholder partnerships soon emerged. These in turn strengthened both the MSTD and itdUPM by attracting more resources. The connection among these initiatives soon became the shared purpose represented by the challenges of the SDG Agenda, creating a virtuous loop (see Figure 1).
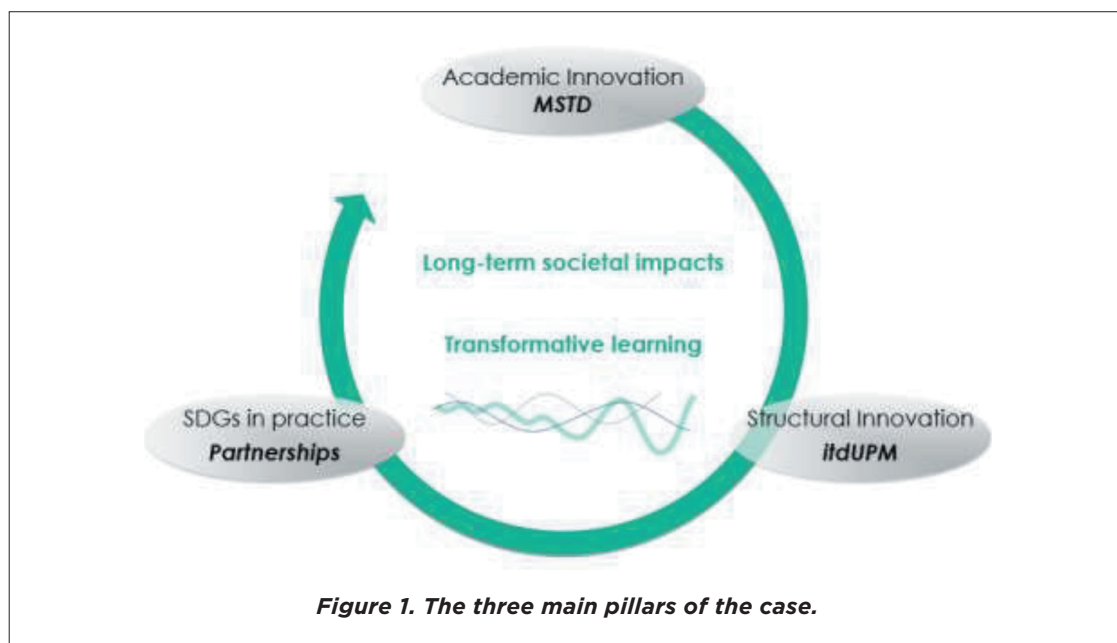

Figure 1. The three main pillars of the case.

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This following section examines the differential characteristics of the three pillars of the UPM case study: academic innovation through the MSTD; structural innovation through itdUPM, and multi-stakeholder partnerships. In the subsequent section, evidence of their impact and transformative learning will be provided.

Academic Innovation: MSTD

In 2015, the MSTD evolved further with the involvement of the Complutense University of Madrid (UCM), a long-established university in the field of Social Sciences and Humanities. The bi-institutional MSTD (that replaced the original Master's) involves 36 faculty across 10 different faculties, with more than a dozen departments and multiple engineering specializations at UPM represented, alongside faculty drawn from social sciences fields coming mainly from UCM. The main goal of the revised MSTD program was to develop innovative answers to complex social and environmental sustainability challenges, in line with the SDGs and the 2030 Agenda. The program aims at developing new inter-disciplinary profiles able to provide analytical and technical support to the 2030 Agenda by combining both technical and social knowledge.

The MSTD program attracts a global student body, who have Bachelor degrees in the fields of engineering, architecture or social sciences, with more than 20 countries represented – with international students 140% above the average UPM rate according to the institutional UPM's MSTD webpage, creating a rich multicultural and multi-disciplinary peer-learning environment. Graduates of the program typically find jobs in multilateral organizations, national development agencies, public administration, consulting or engineering companies active in the sustainability or development sector, and non-governmental organizations.

In terms of methodology, the MSTD program applies action-oriented learning approaches at different levels. Section 4.1 presents a description of the learning goals of the program, as well as the learning approaches implemented. The educational offer covers a wide range of thematic areas such as gender issues, challenges of access to basic services, the role of institutions and the role of networks and partnerships, essential in the field of sustainability and development (details about the Master's modules are provided in Appendix 1). Student satisfaction with respect to MSTD's pedagogical methodologies is 14% above the UPM average rate (6.4/10 regarding methodologies and 7.1/10 regarding evaluation) according to the institutional UPM's MSTD webpage.

Key to the academic innovation, the MSTD was supported by about 40 partner organizations interacting with the program in different ways, for example, participating in delivery of lectures, contributing to the dissemination activities, and offering internships (see Appendix 2 MSTD partner organizations). These organizations are drawn into the processes of continuous improvement of the Master's through its Quality Commission, which culminates in an annual meeting to formalize needs
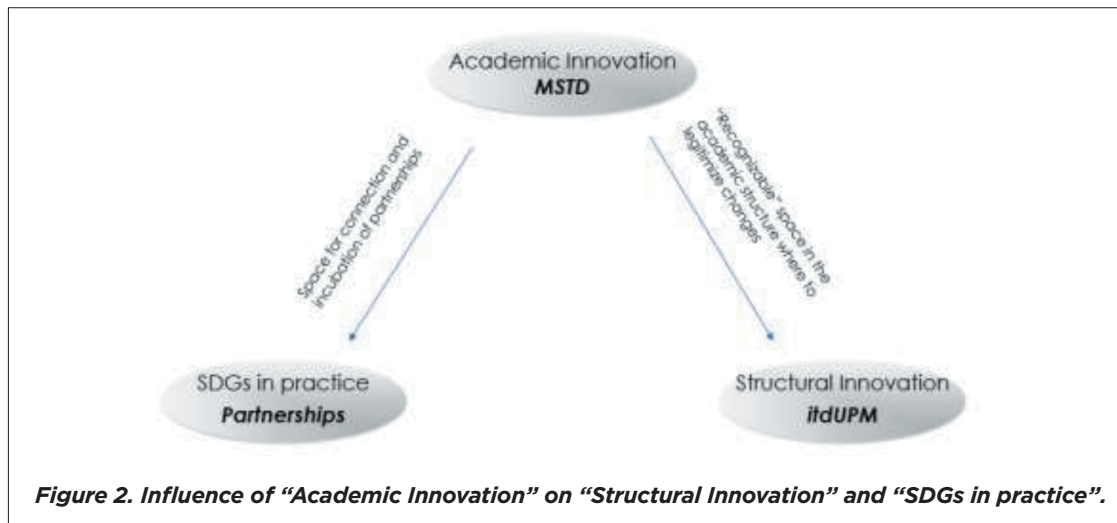
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Figure 2. Influence of "Academic Innovation" on "Structural Innovation" and "SDGs in practice".

and improvement measures. These features make MSTD a high demand degree program, being the third most popular Master's of the UPM's specialization offer (out of a total of 97 degree programs); it has 3.6 times more students than the UPM's Masters average. The MSTD placement rates are about 90% (from 2019 graduates), similar to UPM and overall rates in Spain (88%). Data is collected by MSTD administration from the Linked-In group in which students and graduates periodically update their status. The originality of the MSTD program in terms of content, design and learning approach goes beyond the application of innovative action-oriented pedagogical methods and the diversity of its ecosystem. It serves to develop a unique purpose that seeks to foster long-term societal impact and transformative learning at UPM (see Figure 2).

The promising outcomes of the MSTD and the shared purpose created among its faculty have encouraged the team to promote SDG-oriented transformative processes at UPM with the support of itdUPM and the governing bodies of the University. Some examples of emergent change are the alignment of UPM's research with the SDGs, facilitated through a process of 20 internal seminars and workshops in which more than 700 faculty from 140 research groups participated (Ezquerra-Lázaro et al., 2021). UPM's governing council committed to decarbonize the University campus by 2030 and achieve climate neutrality by 2040, and went on to mandate the inclusion of the SDGs in all subjects of all UPM degrees.

The MSTD program attracts professionals from diverse organizations (public, private, NGO) to work with UPM by collaborating in teaching, providing data or cases to analyze in different subjects or hosting student interns. In this way, trust was developed and the shared vision consolidated. This relational capital has contributed to the generation of pioneering multi-actor partnerships in the Spanish and international sphere (Moreno-Serna *et al.,* 2020), which in turn is increasing the long-term social impact of the Master's program.

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Structural Innovation: itdUPM

The structural innovation represented by itdUPM was created in 2012 to foster collaborative research and learning among sustainability oriented UPM research groups, facilitating inter-structural management within UPM system. An appropriate metaphor for the visualization of itdUPM's particular intermediation approach is the image of a dual-operating system (Kotter, 2014; Purcell, 2019a), an agile network-like structure (operating system B - network) that operates across traditional academic structures (operating system A - traditional) in order to accelerate change (Kotter, 2014; Purcell, 2019; Purcell & Chahine, 2019). The 'operating system B' of itdUPM acts as an orchestrator or facilitator of the MSTD-UPM ecosystem. This represents an innovative organizational structure needed to foster the systemic transformation at the heart of the SDGs (UN, 2014), based on deeper and more solid collaborative arrangements and multi-stakeholder partnerships (Horan, 2019).

The itdUPM has a self-funded core team that performs the facilitation function (Moreno-Serna *et al.,* 2020). This interdisciplinary 15-people team focuses its activity around:

- *Generation of a collaboration context*: establishing and nurturing connections among the different actors and initiatives of itdUPM's ecosystem, mapping the knowledge communities, organizations and people relevant to itdUPM's work. This 'connection' work was carried out for people inside the university as well as those outside the academic community, including from all type of organizations i.e. public administrations of different political affiliations, private companies and NGOs.

- *Design*: promoting the generation of shared value with inclusive co-creation of activities among faculty and partners, and facilitation of a framework for systematic management, coordination and continuous improvement. The physical infrastructure played an important role and itdUPM's location is an emblematic bioclimatic building inside the UPM campus and was itself conceived as a living laboratory. This was recognized as a good practice exemplar in the International Sustainable Campus Network 2017 report "Educating for Sustainability" (Paige, 2017). The building includes informal gathering spaces, built with experimental sustainable materials, and is open to all members of the university community and is used extensively by MSTD students.

- *Mediation*: facilitating key collaborative efforts, creating a neutral and safe space for dialogue and addressing procedures that are not adapted for long-term transformational partnerships. Special care is given to the constructive resolution of conflicts and to the development of strategies for addressing frustration or disagreement.

- *Promotion:* key transversal processes such as innovation, learning and gaining wider influence are supported. Many itdUPM projects are initiated through crowd sourcing, and involve MSTD students and faculty. Furthermore, core members are trained to apply specific dynamic
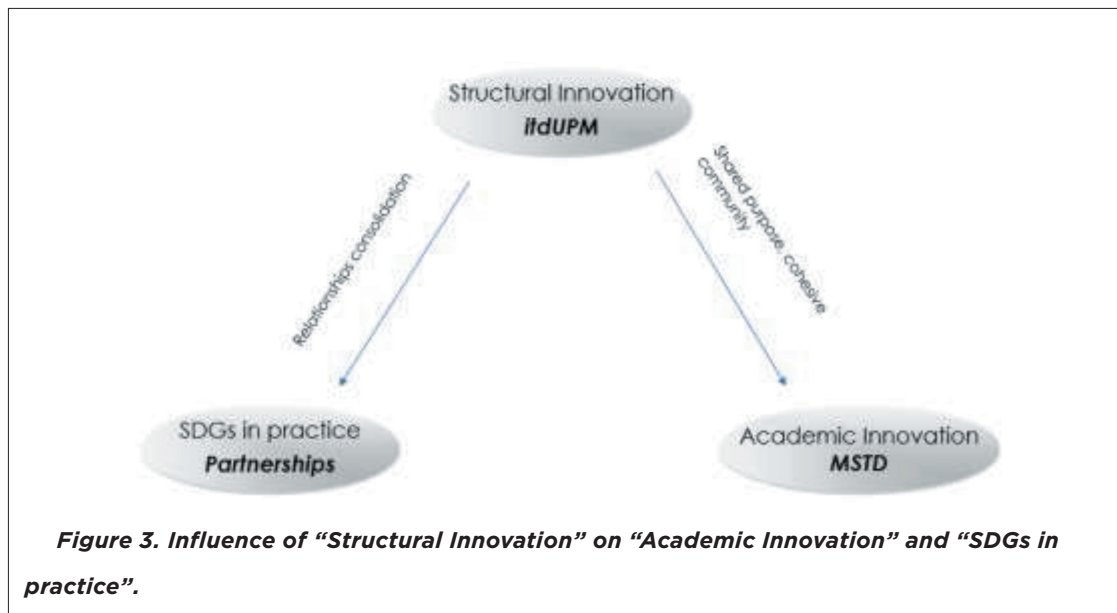
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discussion techniques by adapting methodologies such as "world café" or "design thinking" in an effort to integrate diverse views and opinions and arrive at collective interpretations of problems and approaches.

Membership of itdUPM relies on a very flexible agreement and is open to all faculty at UPM, being compatible with affiliation to departments and research groups. It serves as a "label" oriented to strengthen the shared purpose around transformational implications (Sachs *et al.,* 2019) of the SDG agenda. For example, MSTD UPM faculty do not have to be members of itdUPM to participate in its offerings but more than 250 UPM faculty are formally members of itdUPM. itdUPM promotes and supports initiatives, always in collaboration with other UPM structures and with partner organizations. The relationships with the most relevant initiatives are shown in Figure 3.

The itdUPM supports (with the direct work of some staff from its core team) the MSTD in the management of its complex ecosystem (80 faculty from two universities, 60 students per course, 40 partner organizations), from the administrative and academic point of view, and in those processes oriented to gain wider influence (communications, relationships management). Faculty from the MSTD face traditional structural barriers such as teaching load imbalances among departments, and the duplication of administrative procedures and tools due to the fact that there are two universities involved in the MSTD with no unified administration channel. These difficulties hinder the creation of a common identity as well as more agile everyday working. itdUPM has worked to alleviate some of these barriers by i) facilitating management by directly interacting

Figure 3. Influence of "Structural Innovation" on "Academic Innovation" and "SDGs in practice".

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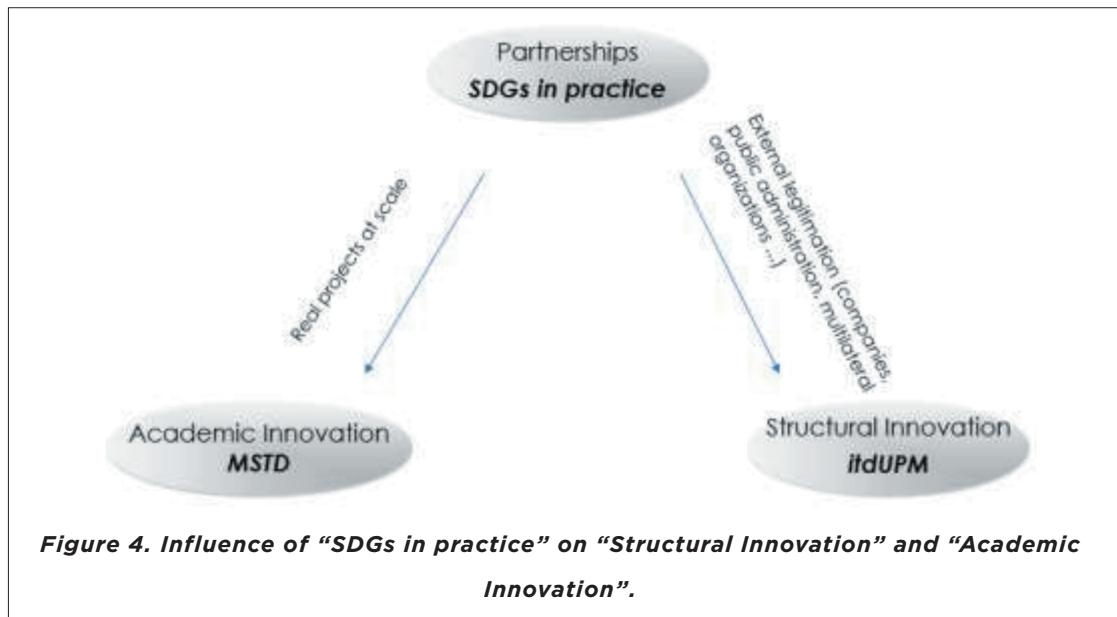
with academic and internship management units from both UPM and UCM; ii) promoting activities to create shared purpose such as international seminars, outdoor workshops and informal gatherings, and iii) fostering an MSTD identity through a solid communications ecosystem. This function is highly valued by students. For example, the support around Master's management (enrollment and administrative processes) is valued 22% above the UPM average (7.58/10), the opportunities and channels to participate in Master's decision-making are valued 33% above the UPM average (6.44/10), and the virtual platform 18% above the UPM average (9.3/10) according to the institutional UPM's MSTD webpage.

Partnerships: SDGs in Practice

The itdUPM supports partnerships focused on the SDGs by nurturing relationships among people and organizations and by facilitating the projects' execution. The consolidation of these relationships has led to the creation of several external-funded professorial chairs at UPM, for example 'The Iberdrola chair on the SDGs' and the 'Brazilian Sustainable Development Institute (IABS) chair on low-carbon agriculture¨. To date itdUPM has been able to raise more than 11 million USD in external funds, has engaged more than 1,000 UPM students from a wide variety of undergraduate and post-graduate UPM degrees (from Schools of Industrial, Civil, Aeronautics, Agronomics, Forestry or Telecommunications Engineering, Architecture, Design, Computing...), and worked with 800 faculty around multiple initiatives (of a total of 4,000 faculty at UPM). These now represent a powerful collaboration among researchers, students and organizations extending beyond UPM's institutional walls that owe their origin to the academic and structural innovation represented by MTSD and itdUPM acting at a gateway to the university and a space to develop, consolidate and sustain relationships. Examples include the Brazilian Sustainable Development Institute (IABS)-UPM partnership, which began with a project to evaluate the implementation of rainwater cisterns in Brazil, and the Alianza Shire initiative to bring renewable energy into refugee camps (Moreno-Serna *et al.,* 2020). All of these initiatives have the MSTD as starting point. Previous relationships between faculty and sustainability-committed professionals from private companies, public sector and NGOs were strengthened by the latter's participation as guest lecturers in the MSTD program, through MSTD student internships at their organizations where they act as 'UPM ambassadors' and through formal meetings and informal dialogue. These interactions allowed collaborative projects to be designed to take advantage of the technical capacities of MSTD faculty's research groups and the organizational support of the itdUPM, growing beyond MSTD and UPM's perimeter and extending globally.

The partnerships selected here to highlight addressed complex challenges that demand an interdisciplinary approach facilitated through the MSTD and itdUPM.

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Figure 4. Influence of "SDGs in practice" on "Structural Innovation" and "Academic Innovation".

Evaluation of the implementation of rainwater cisterns Brazil

The project "Evaluation of school cisterns for rainwater collection" in Brazil was carried out between 2013 and 2014 in response to a need to verify the effectiveness, management model and possibility of expansion of a particular sustainable cistern technology (see the informative video: https://youtu.be/p6mRLTMC48w). The Brazilian Ministry of Social Development, in collaboration with international donors, including the Spanish International Development Agency (AECID, a public agency that forms part of the Foreign Affairs Ministry) was promoting an ambitious program of construction of residential rainwater cisterns ("One million cisterns" http://mds.gov.br/assuntos/seguranca-alimentar/acesso-a-agua-1/programa-cisternas). The objective was to reach one million people, 50% of rural households in a semi-arid region of Brazil that has the lowest human development index and the highest vulnerability to climate change in the country.

One of the main AECID contributions to the program consisted of testing the possibilities of new water-collection technology through the placing of cisterns in 108 schools in the Alagoas State. Because of previous relationships and the participation as guest lecturers of several AECID technicians, the UPM was considered to have the interdisciplinary scientific capacities and experience necessary to carry out a field evaluation. It consisted of analysis of three components: the civil and hydraulic work; the quality of the water supplied by the cisterns, and the effects on the living conditions of the school community. The project team included three MSTD faculty and seven members of their research teams, specialized in monitoring and evaluation, water quality, structures, hydraulics and industrial engineering. In addition, three MSTD students conducted their internship and produced

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their Final Master's Thesis (FMT) on this project, and a member of itdUPM core team supported the project management and relationship building. As will be detailed later, the results of this project were used as a source of data and evidence during the second semester of the MSTD through the "Project Based Learning" approach. [The account of the experience of two of these students are available here: http://www.itd.upm.es/2014/05/09/el-camino-del-agua-mis-practicas-del-master-en-alagoas-brasil/; http://www.itd.upm.es/2014/04/07/proyecto-cisternas-escolares-maria-perez/; with images https://www.flickr.com/photos/itdupm/sets/72157635357643215/show/.]

Partnerships for innovation in access to basic services

Universal access to basic services such as health, water, sanitation, energy or waste management remains a challenge in large areas of Latin America, particularly for those groups and communities that experience structural inequalities related to geographical distribution (isolated or remote areas), socioeconomic context, racial origin, gender or education. In an effort to reverse this situation, the Multilateral Investment Fund of the Inter-American Development Bank (MIF-IDB) worked as an 'IDB innovation laboratory' that finances, with an annual budget of around 100 million USD, pioneering actions oriented towards vulnerable populations. MIF-IDB noted that the establishment of partnerships between public administrations and non-state actors for the last-mile provision of basic services to isolated populations in Latin America offered a promising strategy for their work and, between 2013 and 2016, launched two international tenders for research in this area. These tenders were awarded to itdUPM who received support for work to analyze key success factors in these types of experiences.

The itdUPM carried out two studies: "Five case studies for the provision of basic services to low-income populations in the Latin American region" (http://www.itd.upm.es/2014/12/04/partnerships-for-innovation-in-access-to-basic-services-five-case-estudies/?lang=en), and "Sustainable energy distribution in Latin America" (https://publications.iadb.org/publications/english/document/Sustainable-Energy-Distribution-in-Latin-America-Study-on-Inclusive-Distribution-Networks.pdf), which involved the analysis of ten disruptive experiences in the provision of basic services with multi-stakeholder management models in areas such as access to energy, healthcare, water and sanitation or waste management. An interdisciplinary team was created, made up of four MSTD faculty and four members of their research teams, two MSTD students and a member of itdUPM core team, together with communication and multi-stakeholder partnership experts from MSTD partner organizations. Case study analysis, including extensive fieldwork, of all the experiences was conducted and the results presented within the MSTD. As will be detailed later, the results of this project were used as a source of data and evidences during the second semester through the "Project Based Learning" approach.
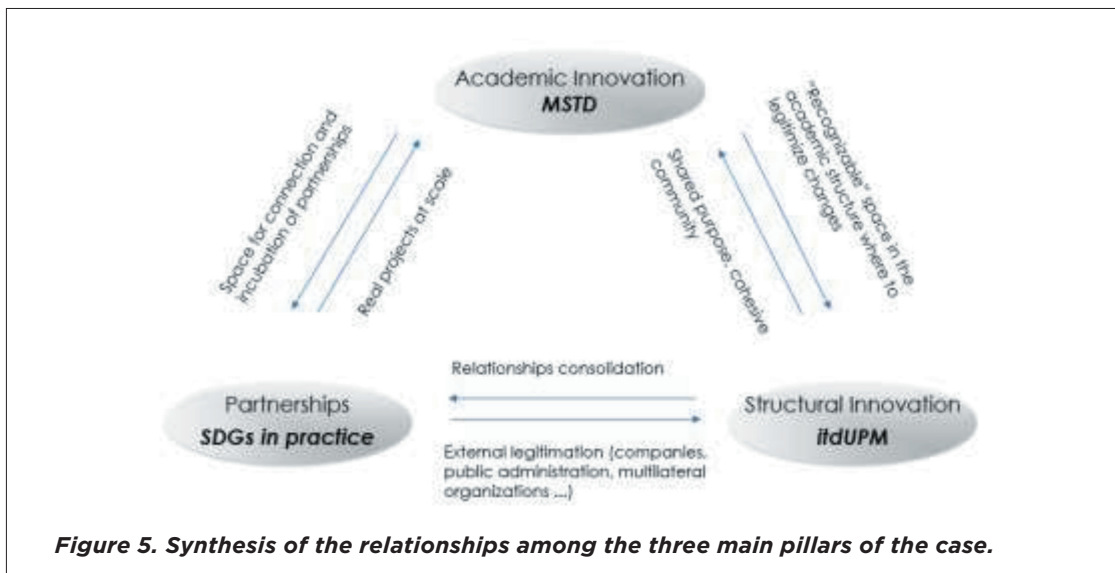
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The Alianza Shire

In 2013, the Office for Humanitarian Action of the Spanish Agency for International Development Cooperation (AECID) commissioned itdUPM to analyze the potential of multi-stakeholder partnerships among public, private, multilateral and NGO entities to improve and help re-frame humanitarian responses. These studies (Herrera Mancilla, 2013) confirmed the relevance of establishing a permanent partnership, the Alianza Shire, devoted to improving access to energy in refugee camps, taking into account both the persistence of the problem and the potential of the energy sector in Spain.

The MSTD was a catalyst for the creation of the Alianza Shire. Some key organizations in the partnership, such as AECID, Acciona Foundation and Iberdrola, were previously associated with the MSTD with their representatives invited as guest lecturers and had developed trusting relationships with itdUPM. An initial leading impulse from two MSTD faculty members and two students during their internship periods, led to this transformative partnership (Moreno-Serna *et al.,* 2020). The Alianza Shire emerged in 2013 as an innovation platform to improve access to energy for refugee populations and their host communities, developing innovative and sustainable energy access initiatives in Ethiopia, launching programs of training, and disseminating learnings for the international humanitarian community. The first pilot project started in 2014 and finished in 2016. The Alianza Shire brings the complex refugee context to the MSTD from the field. Each course, its progress is analyzed in flipped classroom sessions with the Alianza Shire's team and seven MSTD students have conducted their internships and FMT at this initiative. A testimony of one of them is provided in Appendix 3. As will be detailed later, the results of this project were used as a source of data and evidence during the second semester of the MSTD through the "Project Based Learning" approach. The Alianza Shire is the first humanitarian multi-stakeholder partnership in Spain and has become a flagship project of its members, including AECID and UPM. Table 1 provides a summary chart of the organizations that participated in the Alianza Shire and outlines their roles.

Table 1. Participating organizations and their roles in the Alianza Shire.

Organization	Type of organization	Role
AECID	Public agency of the Ministry of Foreign Affairs of Spain	International and field institutional support
Iberdrola	Private company	Mobilize technical capacities in operation and maintenance of electrical networks
Signify (formerly Philips Lighting)	Private company	Mobilize technical skills in lighting
Acciona.org	Business foundation	Mobilize technical capacities in renewable off grid energy provision
UNHCR	Multilateral organization	Needs assessment and field logistics support
itdUPM	Public university	Facilitation: coordination of initiatives, learning processes, promotion of new actions, sharing results with the international community

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Figure 5. Synthesis of the relationships among the three main pillars of the case.
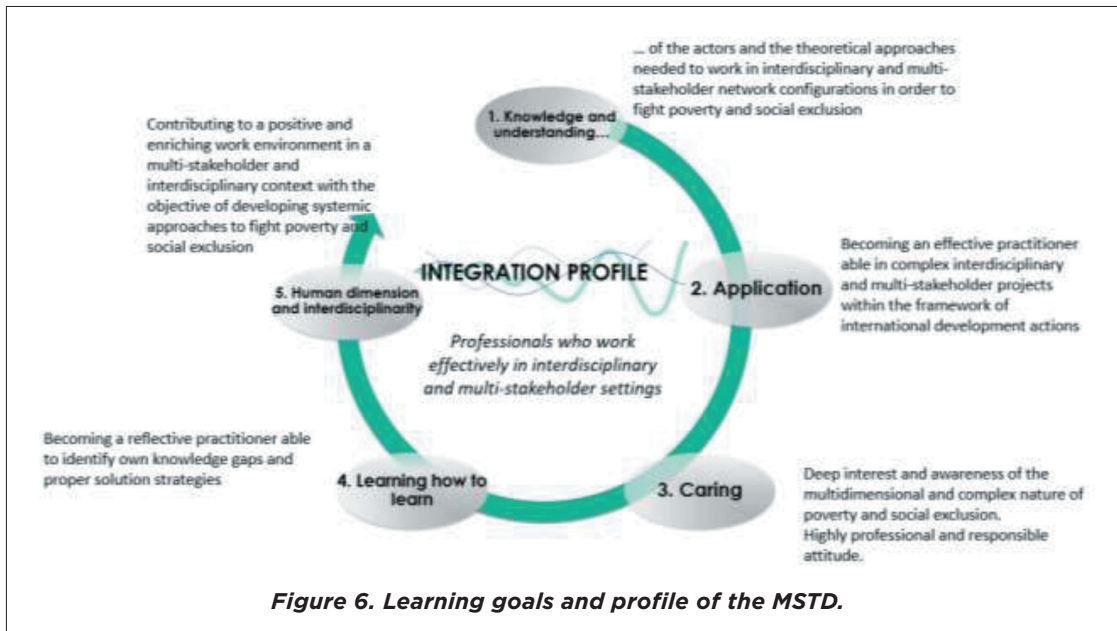
Closing remarks

Throughout this section, we have examined the rich interactions that can occur through a university, driving transformational sustainability, and using an academic innovation initiative, a structural innovation initiative and the resultant multi-stakeholder partnerships that arose in this context (see Figure 5). The next section provides evidence of the transformative learning process and the long-term societal impacts that the aforementioned interactions are yielding.

RESULTS

Transformative Learning

Learning goals and structure

Many universities Master's programs aim to develop specialists in a given field. The MSTD has a complementary function that we consider essential for generating true impact: to educate professionals who are able to work in inter-disciplinary teams and multi-actor frameworks of collaboration. Appendix 4 shows the learning goals of the MSTD Program using a slightly adapted version of the Fink's significant-learning taxonomy (Fink, 2013). Five types of learning are considered: Foundational Knowledge, Application, Caring, Learning how to Learn, and Human Dimension and Interdisciplinarity, which work in a synergistic manner to arrive at the final desired profile (see Figure 6). As it can be seen, the learning goals defined are aligned with the key competences for sustainable development in higher education identified in the literature (Lozano *et al.,* 2017), such as interdisciplinary work; interpersonal relations and collaboration; systems thinking; and empathy and change of perspective and personal involvement.

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Figure 6. Learning goals and profile of the MSTD.

In terms of structure, the Program has a duration of three semesters (90 ECTS) and is composed of the following building blocks:

- Foundations of sustainability (semester 1): comprises a number of thematic modules addressing key actors, instruments and policies as well as key challenges and possible strategies.
- Specialization block (semester 2): students can choose between two course routes, namely Technology or Policy. itdUPM is directly responsible of the organization of the Technology route, addressing issues such as land planning, energy and water management, habitat, information and communications technologies.
- Internship period and Master's thesis (semester 3): includes a period of 14 weeks during semester 3 in an organization outside UPM and the completion of a research thesis.

Teaching and Learning approaches

Regarding teaching and learning approaches, the program adopts the good practices identified in sectorial and academic literature. Lozano *et al.* (2017) proposed an account of pedagogical approaches that could be used to foster sustainable development competences. The proposed framework included action-based approaches, such as project or problem-based learning or participatory action research, and other more traditional strategies, such as lecturing or case studies. A recent publication by the Sustainable Development Solutions Network (SDSN, 2020) aimed at disseminating good practices and tools to guide universities in approaching the SDGs, stressed three features of a transformative learning approach: interdisciplinarity; action-based learning, and multi-actor involvement.

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In line with Lozano *et al.* (2017), the MSTD program uses a mix of traditional and more innovative learning approaches. Traditional lectures, real-life case studies, simulations and flipped classroom techniques are applied at the level of each thematic module. The transformational features, interdisciplinarity, action-based learning and multiactor involvement, are included to different extents in all modules of the Master's. However, they are particularly present during the specialization block, the internship period, and the Master's thesis preparation phase. Indeed, during the second semester, the specialization block adopts a "Project Based Learning" (PBL) approach. PBL is a teaching and learning methodology that organizes learning around projects. Projects in this context are complex tasks, based on challenging issues and questions that involve students in design thinking, problem solving, decision-making, and/or investigative activities. They create opportunities for students to develop team working relatively autonomously over extended periods of time and culminate in realistic products or presentations (Barrows, 1986). In this particular case, (see https://www.upm.es/master/etd/?page_id=7) each of the four thematic modules applies the PBL methodology to analyze a specific development challenge. In addition, students are involved in a transversal and multidisciplinary capstone project through which competences in all thematic modules of the itinerary are applied. The MSTD Program's particular implementation of the PBL philosophy is described extensively by Mazorra *et al.* (2016). Appendix 5 provides a more detailed description of the design of the specialization block, the PBL approach and its evaluation.

Finally, the internship period, normally linked to the development of the final Master's thesis, takes place in one of the more than 40 organizations (universities, international organizations, NGOs, companies or think tanks) that collaborate regularly with the Program (see "Students testimonies" in Appendix 3). The students have the opportunity to integrate in a team in the context of a real-life project. In the projects described in this account, the Master's thesis have made an outstanding contribution to consolidating learning and critical processes. For example, in the case of the Alianza Shire, some of these thesis have served to help lay the foundations of the partnership and define its added value in the humanitarian system, to systematize the operational learnings of the pilot project, or to carry out a prospective work on the current needs and new possibilities for the partnership (see details in Table 2).

Table 2. Examples of Master's thesis at the Alianza Shire.

Topic	Author	Link	Year
Public Private Partnerships in the Humanitarian Aid	Herrera Mancilla, Alex Oliver	http://oa.upm.es/21656	2013
Strategies for energy access in refugee camps: The case of the Alianza Shire	Pastor Gutiérrez, Manuel Alberto	http://oa.upm.es/62878	2017
Fostering social innovation within transformative partnerships: The case of Alianza Shire and Lab Shire	Mendoza Figueroa, Dalia	http://oa.upm.es/62860	2020

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Student and program assessment

Regarding student assessment, a variety of methods are applied, depending on the type of teaching and learning activity and the targeted learning goal. Traditional assessment methods, such as written exams are used to assess basic knowledge assimilation. Otherwise, formative and self-reflective assessment methods are applied, such as student portfolios (particularly during the PBL itinerary and the FMT); written assignments and oral presentations. Several assessment meetings are also planned in certain modules to assess the progress of the students and provide formative feedback and support.

Furthermore, assessment is related to the learning goals of the program and to the rubrics or standards defined at the level of each module. A complete account of the assessment methods and rubrics used for the PBL itinerary was provided in Mazorra *et al.* (2016).

In terms of program assessment, the effectiveness of the program is assessed through various mechanisms:

- Student surveys.
- Student employability follow up. Currently, 90% of the MSTD students are employed in positions directly linked with the competences developed through the program.
- Periodic academic commissions, in which faculty and students meet to exchange impressions on the program's progress.
- Official quality assurance procedures applied by the Spanish higher education authority. Each semester and academic year, self-assessment reports are produced in the context of these procedures. Exemplars of reports corresponding to the academic year 2018-2019 are accessible through:

  https://www.upm.es/comun_gauss/publico/anexos_IS/2018-19/1S/IS_anexos_20AE_1_1S_2018-19.pdf

  https://www.upm.es//comun_gauss/publico/informes_titulacion/2018-19/IT_20AE_2018-19.pdf

Long-Term Societal Impacts

Subsequent analysis of the three pillars of the case, (academic innovation, structural innovation and the creation of multi-stakeholder partnerships) draws upon the 'theory of change' (Brest, 2010) to describe and quantify the outputs (direct delivery of a project, expressed in concrete products), outcomes (direct benefits to a targeted community), and impacts (the contribution to systemic goals, where there is an indirect attribution). Table 2 provides a synthesis of the impact chain of the three illustrative partnerships.

Evaluation of the implementation of rainwater cisterns Brazil impacts

Outputs: The results of the evaluation showed a positive effect of the cisterns upon the living conditions of the populations where the project was undertaken, both by the construction of the cistern, and by the subsequent process of mobilization and social participation. In addition, a set of

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Table 3. Synthesis of partnerships' long-term societal impacts.			
Partnership	**Outputs**	**Outcomes**	**SDG Impacts**
Rainwater cisterns in Brazil	Recommendations on the critical aspects in the construction, management, and effects in the school community.	Access to safe water in 108 scholar cisterns, improving the lives of 10,000 children. Contribution to the creation of Brazilian innovation center "Centro Xingó".	In Brazilian public policy (recommendations adopted to 3.000 cisterns in the semiarid region). SDG 6-Clean water and sanitation- (specifically through its targets 6.1 6.a 6.b).
Basic services partnerships	Lessons learned: – Redesign of product and service supply chains. – Use of existing technologies combined in an innovative way. – Solution design processes including sense making.	Influencing critical stakeholders regarding the need to promote partnerships to provide basic services in Latin America.	Basis for the Multilateral Investment Fund of the Inter-American Development Bank basic services strategy. World Bank multi-stakeholder partnership publication. SDG 17- Partnerships for the goals- (through its targets 17.1 and 17.17).
Alianza Shire	Pilot project in a refugee camp on the Shire Region (northern Ethiopia). Scaling up project to four refugee camps and their host communities.	Access to energy, lighting to 8,000 people. With the scaling-up project extending to 40,000 people.	To CRRF (United Nations comprehensive refugee response framework). SDGs 7- Affordable and clean energy- and 17-Partnerships for the goals (through their targets 7.1 7.a 7.b 17.17).

detailed recommendations was produced (http://editora.iabs.org.br/site/index.php/portfolio-items/avaliacao-de-cisternas-escolares-no-semiarido-alagoano-vol-6/) related to key success factors: construction process, maintenance, specific roles in the management model of the cisterns, and the relationship between the schools and the neighborhood communities.

Outcomes: The project brought direct outcomes, such as the improvement in the construction, management and maintenance of rainwater collection tanks in 108 schools. Adequate access to water in schools improved the lives of 10,000 children in the Brazilian semi-arid region. This strengthened the capacities of their school community (resilience against water supply problems, or being able to develop new educational projects), improving their health (by reducing the incidence of water diseases), and improving the stability of their communities (by decreasing the tensions and conflicts associated with the lack of water).

In addition, due to the relationships, information and resources provided by the project, other initiatives related to the access to basic services in the Brazilian semi-arid region were undertaken at UPM and enriched the evaluation process. These included a doctoral thesis and three final MSTD projects, the celebration of the International Hand Pumps Congress (http://www.itd.upm.es/2013/12/03/resumen-primeras-jornadas-internacionales-sobre-bombas-manuales-y-de-ariete/), the creation of the journal "Design and Technology for Development" (http://polired.upm.es/index.

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php/distecd/issue/view/296), and publication of three articles related to the project. This initiative also permitted the contribution of two MSTD faculty to the conceptualization and launching of the Xingó Center (https://xingo.com.br/), a center of innovation in social technologies located in the heart of the state of Alagoas that serves as a space for experimentation and meeting between Brazilian and international institutions.

Impact: The evaluation conducted by itdUPM provided the Brazilian Ministry of Social Development with the basic information that supported its decision to consolidate and expand the program to 3,000 cisterns in schools, supporting one of the most ambitious community-led public policies for universal access to water in Latin America (Fressoli *et al.,* 2014). This work contributes directly to SDG 6 'Clean water and sanitation', specifically through its targets 6.1 6.a 6.b.

Partnerships for innovation in access to basic services impacts

Outputs: the analysis of the 10 cases studied for the Inter-American Development Bank enabled the identification of several success factors in the design of models for the last-mile provision of basic services in isolated regions, related to the following areas:

- Redesign of product and service supply chains.
- Use of existing technologies in an innovative way.
- Design of spaces that promote a culture of experimentation and lifelong learning.
- Focus on the establishment of cooperation and partnerships.
- Creation of dissemination and scaling-up strategies that follow new patterns.
- Solution design processes including sense making.

Outcomes: The studies were used to position the need to promote partnerships between public, private, civil society and academia to adequately provide basic services to the population of the last mile in Latin America, with critical actors in the design of public policies in the region. A presentation was made in Washington, D.C. with the main implementing partners of the MIF, and another in Spain, organized by the Spanish International for Development Agency (AECID), which contributed to the position adopted by Spain at the Addis Ababa Development Financing Conference in 2015 (https://www.cooperacionespanola.es/es/comunidad/jornadas/foro-de-debate-preparando-la-conferencia-de-financiacion-del-desarrollo-de-addis).

Impacts: The MIF Basic Services Strategy has endorsed the study's conclusions, and actively promotes them within its network. In addition, other relevant international actors have used the report as reference material. The report was included in the "Public-Private Partnerships Legal Resource Center of the World Bank" (https://ppp.worldbank.org/public-private-partnership/library/partnerships-innovation-access-basic-services-alianzas-para-la-innovaci%C3%B3n-en-acceso-servicio).

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This was the only study produced by a Spanish academic institution included in this source. This work contributes directly to SDG 17- Partnerships for the goals- through its targets 17.1 and 17.17.

The Alianza Shire impacts

Outputs: From 2016-2017, the Alianza Shire developed a pilot project in a refugee camp in the region of Shire, Ethiopia, which was able to provide electricity services to more than 8,000 refugees; installing 5 km of street lighting (with 64 light posts), connecting 14 communal services, and improving more than 20 km of electrical installations. During the process, more than 20 local workers were trained, some of whom are now responsible for maintenance in collaboration with the operating institutions in the field.

Given the pilot project's success, in 2018 a scaling-up program was begun, funded by the European Union. This was aimed at extending access to safe energy and lighting to four other camps and their host communities through the installation and improvement of 25km of public lighting, 30 connected community services with protection, 450 small private refugees' businesses connected to the camp grid, more than 200 trained people and 1700 solar home systems distributed with mixed business models managed by refugees and host community. With the scaling up of the project, access to safe energy and lighting will be provided to 50,000 refugees and people living in the areas surrounding the refugee camps by the end of 2021.

Outcomes: The pilot project involved access to safe energy and lighting for 8,000 refugees. This contributed to a 60% reduction in incidents related to burglaries in the dark hours in the following months, a reduction in the collection of firewood for cooking of 1,500 tons per year, a saving in CO_2 emissions of 2,000 tons per year, and an economic saving for the camps operators in diesel of € 30,000 per year (see project's outcomes report at https://alianzashire.org/case-study-alianza-shire-energy-access-to-refugees/?lang=en).

Impact: Alianza Shire is contributing to the implementation of the Comprehensive Refugee Response Framework (CRRF), the new mandate derived from the New York Declaration in 2016 (https://www.unhcr.org/new-york-declaration-for-refugees-and-migrants.html). The CRRF represents an unprecedented opportunity to develop responses to refugee situations in a comprehensive way with the involvement of a broader array of stakeholders to prepare for and facilitate durable solutions in a more effective and timely manner. The Alianza Shire intervention is completely aligned with the CRRF approach, promoting the integration through the design of business models based on solar energy and the creation of joint ventures between both refugees and the host communities.

Alianza Shire has received international awards for its innovative contribution to humanitarian response through a multi-stakeholder approach. One of the awards is from the SET4Food (Sustainable Energy Technologies for Food Security in Humanitarian contexts, see: https://twitter.com/itdupm/

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status/984444667990364162) an initiative promoted by the European Union Humanitarian Aid and
Civil Protection (ECHO) and another is from the United Nations Global Compact (https://recono-
cimientosgoods.com/ganador-ods-17/). This initiative contributes directly to SDGs 7- Affordable and
clean energy- and 17-Partnerships for the goals- through their targets 7.1 7.a 7.b 17.17.

CONCLUSIONS

The present study reveals how an HEI can pursue its academic mission and at the same time
generate long-term societal impact. Academic innovation is considered a necessary condition,
but is not sufficient alone. The case demonstrates that the innovation processes must go beyond
the borders of educational programs to promote changes in the internal structure of universities.
Although a favorable institutional context may help, the inertia of conventional university structures
highlights the need for new models that combine the entrepreneurial capability of a network with the
organizational efficiency of a traditional hierarchy. In our case, the synergistic relationships between
the MSTD, as the academic innovation, and the itdUPM, as the structural innovation, both within
the university and acting together have contributed to generating an ecosystem of collaborative
relationships that extends beyond the university itself, and takes advantage of the potential for joint
action between companies, civil society, public administration and academia.

As revealed by this case, to incubate and maintain these collaborative arrangements, it was
necessary to develop social, trust and relational capital. Multi-stakeholder ecosystems, such as that
created by UPM, may furnish learning and research opportunities for students and staff, and income
generating activities for universities. However, to keep this "virtuous loop" active at HEIs, innovative
intermediate structures such as itdUPM are required to cultivate trust capital and foster value creation.

Pan-institutional inter-disciplinary sustainability-oriented courses, programs and degrees may
serve as a powerful lever for HEIs to contribute to 2030 Agenda. They also represent vehicles for
effecting change within an institutional context, in this case represented by an intermediary social-
ized network that connected the University with a local and global stakeholder group. The ability
of HEIs to both pursue their academic mission and at the same time work towards delivery of the
SDGs is revealed here through the impactful research-led solutions developed that have real societal
impact – transforming lives through education and research.

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APPENDIX 1: DETAILED MASTER'S MODULES

Table 4. Detailed first semester master's modules.

Subject	Brief description
Common block (1 semester)	
Introduction to the theory of development	The international system and the developing countries.
	Impacts of the evolution of the Science and Technology system.
	Public policies for the promotion of development.
The cooperation for development system: actors, policies and instruments	Genesis of the cooperation system.
	Actors of the cooperation system: bilateral agencies and multilateral, the role of NGOs.
	Main policies and instruments.
Transformations towards environmental sustainability	Contextualization of global change, lack of access to essential services and proposals for sustainable development.
	Understandings of climate change its components causes and consequences.
	The magnitude of lack of access to essential services together with their vulnerability to future climate scenarios (with special attention to water and energy sectors).
	Identification of environmental sustainability strategies and their funding opportunities.
Networks and partnerships for development	Configuration and Management of organizations.
	Organizational networks.
	Partnerships for Sustainable Development and new forms of collaboration.
Methodologies	Identification tools and methods: Participatory Action Research (IAP or PAR) and Rapid Rural Diagnosis (DDR or RRA).
	Planning, management and evaluation tools.
	Logical Framework Approach and Management for Development Results.
	Risk Management.
	Communication in multicultural environments.
Policies for the promotion of gender equality	Methodology for the design of policies that promote equality; health and gender, education and gender, and budgets with a gender perspective.

Table 5. Detailed second semester master's modules.

Subject	Brief description
Specialization block: Technology(2nd semester)	
Territorial planning and development	Conceptual, legal, and institutional frameworks of spatial planning and development; Methodologies and techniques for the development of (participatory) planning and territorial development plans; Entities in the management of territorial plans, monitoring and control; Case study (Project Based Learning).
Basic habitat techniques	Human settlements in the territory, population, habitability and the HDI; The precarious habitability: characteristics, quantification and consensus; The basic habitability; stages and instruments for its endowment; Low cost construction techniques, materials, techniques and processes. Case studies in different situations: illegal takeovers, informal or planned parceling, emergencies.

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Table 5. (Continued)

Specialization block: Technology(2 semester)

Subject	Brief description
Appropriate techniques in the provision of basic services	Capacity to incorporate appropriate technologies to development contexts with processes of universalization of basic services (linked to water resources, energy and environment), considering, production, distribution, maintenance and sustainability.
ICT for Development	This subject displays the potential of ICT for sustainability and develops skills for its application. It also deals with issues related to concepts, instruments, and communities linked to the creation, use and distribution of free technologies and telematic services. Case study and project-based learning are applied.
Optional subjects	Students must choose two subjects between the following: Aquaculture, Application of GIS and IDEs, Competencies for development and sustainability work, Emigration and development, Community forestry, Foundations of Agriculture for Development, Innovation and Entrepreneurship, Microfinance, Qualitative Methods.

APPENDIX 2: MSTD PROGRAM PARTNERS

Table 6. Detailed list of MSTD partners.

Organization	Type of organization	Web
Agencia Española de Cooperación Internacional para el Desarrollo (AECID: Spanish Agency for Development)	Public agency of the Ministry of Foreign Affairs of Spain	https://www.aecid.gob.es/
Agencia Uruguaya de Cooperación Internacional (Uruguayan Agency for Development)	Public agency of the Ministry of Foreign Affairs of Uruguay	https://www.gub.uy/agencia-uruguaya-cooperacion-internacional/
Alianza por la Solidaridad	NGO	https://www.alianzaporlasolidaridad.org/es/
Ayuda en Acción	NGO	https://ayudaenaccion.org/ong/
Ayuntamiento de Madrid (City of Madrid)	Local public administration	https://www.madrid.es/
CAF (Latin America Development Bank)	Multilateral organization	https://www.caf.com/
Caritas	NGO	https://www.caritas.es/
CESAL	NGO	https://www.cesal.org/inicio
Change.org	Private company	https://www.change.org/
UNICOMFACAUCA (Colombian education corporation)	Private company	http://www.unicomfacauca.edu.co/
Deloitte	Private company	https://www2.deloitte.com/es/es.html
Engineering for change	Online platform	https://www.engineeringforchange.org/
FAO	Multilateral organization	http://www.fao.org/home/es/
Fundación Acciona Microenergía	Private company foundation	https://acciona.org/es/
Fundación Mujeres por África	NGO	https://www.mujeresporafrica.es/

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Table 6. (Continued)

Organization	Type of organization	Web
Fundación EHAS	NGO	http://www.ehas.org/
Instituto Brasileño de Desarrollo Sostenible	NGO	http://iabs.org.br/
Iberdrola	Private company	https://www.iberdrola.es/
ICEX (Spanish Institute for Foreign Trade)	Public company	https://www.icex.es/icex/es/index.html
Instituto de la Mujer y para la Igualdad de Oportunidades	Public agency of the Ministry of Presidency of Spain	http://www.inmujer.gob.es/
Instituto de Salud Global Barcelona	Public research center	https://www.isglobal.org/
Medialab Prado	Public cultural center (citizen laboratory)	https://www.medialab-prado.es/
Médicos del Mundo	NGO	https://www.medicosdelmundo.org/
Médicos Sin Fronteras	NGO	https://www.msf.es/
Secretaría General Iberoamericana	Multilateral organization	https://www.segib.org/
Ongawa	NGO	https://ongawa.org/
Oxfam Intermón	NGO	https://www.oxfamintermon.org/
porCausa	Journalism foundation	https://porcausa.org/
Real Instituto Elcano	Spanish public think tank	http://www.realinstitutoelcano.org/wps/portal/rielcano_es
UN-Habitat	Multilateral organization	https://es.unhabitat.org/
UN-Global Pulse	Multilateral organization	https://www.unglobalpulse.org/

APPENDIX 3: STUDENT'S TESTIMONY

By Manuel Pastor June 2017

(Extracted from http://www.itd.upm.es/masteretd)

During my internship in the Master in Strategies and Technologies for Human Development, I have been able to collaborate with itdUPM in Alianza Shire.

Alianza Shire is the first multi-actor partnership launched in Spain. It is conceived as an innovation platform whose main objective is to develop sustainable solutions to improve access to energy for refugee and displaced populations. This partnership is made up of itdUPM, AECID and three leading Spanish companies in the energy sector (Iberdrola, Philips Lighting and the ACCIONA Microenergía Foundation). In addition, it has UNHCR as a collaborating partner and the Norwegian Refugee Council (NRC) as implementing partner.

My activities have been linked to the facilitator role played by itdUPM in this partnership. As a facilitating or integrating entity, the university has been responsible for managing, providing

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encouragement and monitoring the joint work process. The university is perceived as an independent and neutral intermediary with the necessary legitimacy and recognition.

With this experience I have been able to participate in the different committees that make up the Alliance, planning the intervention of the pilot project, developing an evaluation strategy, systematizing the information and supporting the team with logistics.

On the other hand, thanks to a cooperation travel aid from the UPM, I was able to travel to the Shire refugee camps in Ethiopia, thus complementing my experience in Madrid. Working in refugee camps in collaboration with an international NGO such as NRC, with experts from the companies and involving the local population has been a sometimes difficult but certainly enriching task, which has allowed me to know first-hand the demand for these contexts and the relevance of access to energy in them.

My evaluation of the internship is completely positive. I have had the opportunity to participate in an international pioneering experience.

Refugee camps in Shire, Northern Ethiopia. Manuel Pastor 2017.

APPENDIX 4: LEARNING GOALS OF MSTD PROGRAM

Foundational Knowledge

Knowledge and understanding of the actors and theoretical approaches needed to work in inter-disciplinary and multi-actor network configurations in order to fight poverty and social exclusion, which involves:

- The historical evolution of the theories on development and inequality as well as the evolution of forms of international cooperation.
- Current approaches to human development and sustainable development.

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- The realities of regional, African, Latin American and Asian poverty and inequality as well as their economic, political, social and environmental effects.

- The organizations and legal, technical and financial institutions of the development aid system, both national and multilateral.

- The actors in the fight against poverty and social exclusion and their strategies and specific modalities of action.

- The methods and tools applicable to the identification, planning, management, execution and evaluation of development policies, programs and projects.

- Technical, economic, management and regulatory needs and availability appropriate to the provision of basic services

Application

Becoming an effective practitioner able in complex interdisciplinary multi-actor projects within the framework of international development and cooperation actions, which involves:

- Applying research techniques appropriate to the identification, knowledge and prioritization of the realities of poverty and social exclusion from a global, regional, national or local perspective

- Applying the appropriate methods and tools for the analysis, planning, management, execution and evaluation of development projects, programs and policies.

- Effectively addressing the barriers and organizational resistances associated to sustainability transitions through the application of change management approaches, particularly in the field of specialization of the student.

- Applying the appropriate techniques available in the fight against poverty and exclusion in processes in the field specialization of the student.

- Developing action programs and training programs aimed at agents or the target population, corresponding to the field specialization of the student.

- Incorporating elements of innovation and permanent improvement in the field specialization of the student.

- Managing specific tools for information management in development programs and projects.

- Effectively communicating the results and impact of his or her work to a specialized and non-specialized audience.

Caring

- Developing a deep interest and awareness of the multidimensional and complex nature of poverty and social exclusion.

- Developing a highly professional and responsible attitude.

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Learning How to Learn

- Becoming a reflective practitioner, able to identify own knowledge gaps in the field of specialization of the student and proper strategies to address those gaps.

Human Dimension and Interdisciplinarity

Contributing to a positive and enriching work environment in a multi-actor and inter-disciplinary context with the objective of developing systemic approaches to address poverty and social exclusion, which involves:

- Understanding the areas of interaction between the field of specialization of the student and other disciplines or fields.
- Constructively integrating a diversity of visions around the development of systemic approaches.
- Handling conflicts effectively and constructively.
- Promoting distributed leadership.
- Paying attention to build and nurture constructive links among the different actors in a network beyond as an end in itself, beyond a short-term view of immediate efficacy.
- Identifying appropriate intrinsic and extrinsic incentives to motivate different actors around the challenges of poverty and social exclusion.

APPENDIX 5: DESCRIPTION OF THE SPECIALIZATION BLOCK (PBL MODULE) - TECHNOLOGY

Description

Four compulsory modules and two optional ones are included as building blocks of the specialization semester, which allows students to acquire the knowledge and skills needed to manage development projects, programs and policies with a technological dimension; these are:

- Territorial planning and development (5 ECTS)
- Basic habitability techniques (5 ECTS)
- Provision of basic services (5 ECTS)
- ICT for development (5 ECTS)
- Two optional modules (10 ECTS)

Together with these modules, the students must complete a capstone assignment as part of the specialization semester. This is teamwork assignment in which the students throughout the semester have the opportunity to develop the competences of all the subjects of the itinerary using a PBL approach. Specifically, students must design a specific solution in a particular geographical context. Furthermore, the work done in the different thematic blocks of the itinerary is related to the chosen

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context. Specific contexts are proposed in which itdUPM is currently engaged through real projects. The contexts currently proposed are:

- Rural area of the provinces of Carrasco, Campero and Mizque in the Department of Cochabamba (Bolivia).
- Shimelba refugee camp in Ethiopia.
- Urban area in the surroundings of Maceió - Alagoas (Brazil).
- Urban area in Makeni, Sierra Leone.

The solutions designed by the students must be aligned with the Sustainable Development Goals and follow a comprehensive approach, so that the main social, political and economic dimensions of the problem are addressed.

Learning Goals

Students have the opportunity to mobilize all learning goals of the MSTD master programme (see Appendix 4).

Teaching and Learning Activities

The main teaching learning activities proposed during the content modules are:

- Magisterial lectures
- Case studies
- Reading and written assignments coupled with a flipped classroom approach

The capstone assignment is organized in the following stages:

1. Team building. Selection of topic and geographical context.
2. Concept design. An initial document must be prepared with a brief synthesis of the solution proposed. Feedback is provided at this stage by the professor regarding the feasibility of the idea.
3. Mid-semester progress report. The progress report is presented in front of the class. Feedback from the professor and the rest of the students is received.
4. Final report and public presentation.

Assessment Methods

Content modules:

- Open-question exams
- Case studies

PBL assignment:

- Written assignments: concept report, progress report and final report. Different dimensions are assessed, in line with the learning goals of the MSTD programme: knowledge, application, caring, learning how to learn and human dimension and interdisciplinary.

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- Presentation assignments: mid-semester presentation and final presentation. Different learning outcomes are assessed, particularly communication abilities and the ability to integrate different visions from a multi-disciplinary audience.

- Follow-up meetings: at least two meetings are organized throughout the course in which different aspects are observed and assessed, particularly, learning autonomy, communication, professional attitude and proactivity, communication skills and teamwork dynamics.

Each team is assigned a reference professor. The assigned professor and the coordinator of the PBL experience conduct the assessment.

Examples of capstone project

Some examples of the capstone projects are available at:

https://www.upm.es/master/etd/?p=498

https://www.upm.es/master/etd/?p=785