UPM campus as a test bed for public policies and social innovation

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Summary

The Innovation and Technology for Development Centre at the Technical University of Madrid (itdUPM) is a collaborative network of Faculty, PhD students and non-academic professionals with a common interest in promoting action research for sustainable development. itdUPM’s inter-disciplinary ecosystem is propitious to co-create innovative technical and organizational solutions to address sustainable development challenges both at the UPM Campus and in the broader society.

Two experiences are presented in this paper as case studies that illustrate the ecosystem dynamics of itdUPM. The first is the refurbishing of the main building of the Centre, that not only serves as the headquarters of the itdUPM but also as an open demonstration space devoted to spread technologies and innovations for sustainability. The second is the creation of a multi-actor platform to embrace a wicked development problem: access to energy in refugee camps.
These two experiences have confirmed the potential role of the campus as a test bed of technological and social innovations that could later be escalated to the broader context, even generating public policies. The suggested model can inspire other universities, especially those where a disciplinary culture is prevalent and resources are limited.

**Introduction: itdUPM as a “niche” in a traditional University environment**

Founded in 2012 at the Technical University of Madrid, itdUPM is an outstanding reference on how a vibrant community of internal and external professionals can be articulated towards a joint endeavor: contribute to advancing towards a sustainable developed society.

Based on the application of a multi-actor transdisciplinary approach, the community shows an innovative character and manages successful sustainability initiatives in the context of a traditional university organized along disciplinary silos. In line with transitions theory (Geels, 2011) and its particularisation within the university domain (Robinson et al., 2013), this process constitutes the emergence of a “niche” that is trying to evolve, be accepted by and influence the mainstream “regime” of the university as a whole. This “niche” has evolved from a set of research groups with a common interest in international development to an organised network of UPM community members and external experts collaborating together on sustainability challenges. The common interest of this network is to promote action research and education for sustainable development, with a strong focus on the social dimension of sustainability.

The network was developed based on low cost and high participation standards, and it is considered to be crucial for the viability and success of the Centre. Its main design principles are as follows:

- multi-actor collaboration, including UPM faculty members and students as well as external professionals and entities;
- intrinsic incentives for collaboration: encouraging participation in a university-based eco-system that promotes sustainability;
- distributed leadership and governance;
- low operating costs, given the limited resources available in the Spanish context;
- transdisciplinary research oriented to problem solving, i.e. joint work from different disciplines, including local resources, to create new conceptual, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address a common problem;
- co-creative use of available capacities and scarce resources;
- similar model for both internal activities and external projects;
- flexible evolutionary design, i.e. the model is adapted to specific circumstances and evolves with experience.
The organisational structure of itdUPM is that of a horizontal network with a technical hub (see Fig. 1). Leadership and governance are distributed but focused decisions are taken by formal bodies, including the following:

**itdUPM Council** which is composed of 217 itdUPM affiliates and chaired by the President of UPM.

**Management Committee** composed of 19 Research Group coordinators and elected by the itdUPM Council.

**Communities of Knowledge and Practice:**
- Commission for Experimental Spaces managing the Research Program in itdUPM facilities.
- Quality Commission for the Master’s program.

**Technical Team** composed of 6 full-time staff who fulfil the enabler node function and act as a “feeder” node that nurtures the network development, and assumes roles of external representation, communications and administration.

**Ad hoc teams**, i.e. specific projects are leaded by ad hoc teams. In the case of Alianza Shire, for example, three specific committees have been established: a Management Committee, a Technical Committee and a Communications Committee.

Now, five years later, itdUPM is a networked organization of over 200 internal (faculty and researchers) and external (practitioners and policy makers) affiliates.
itdUPM acts as a “living lab”, i.e. an open innovation sustainability platform which has created an eco-space that has attracted a vibrant research community, including faculty, researchers, external professionals and organizations. itdUPM has also developed an inter-university Master program on sustainable development, along with several innovative technological research projects, and various transdisciplinary projects focused on sustainable development. Consequently, itdUPM is contributing to the diffusion and adoption of a new culture of sustainability, both within a traditional technical university and through wider relationships with different public and private entities.

A “Campus for Sustainability” Model

itdUPM research, training and advocacy activities are designed and implemented through co-creation and co-production methodologies. This is fostering a more open and collaborative culture among researchers.

As a result, itdUPM is able to offer a unique combination of capabilities and experience that has been crucial for the design of innovative initiatives funded by international donors.

Figure 2 depicts itdUPM sustainability approach, considering the abovementioned aspects. In the horizontal axis, according to Manzini (2015) two complementary aims are represented, from practical solutions of sustainable problems, to positive behavioral societal changes and mindsets. The vertical axis shows the degree of interaction among actors: from actions confined in the University space, to actions where the University Campus is a field of collaboration with public, private, and social actors.

![Fig. 2: itdUPM framework (2017). Source: the authors](image)

itdUPM sustainability goals are aligned along the resulting four quadrants: a) campus as a multi-stakeholder collaboration space; b) solutions to sustainability problems; c) sense making and behavioural changes in society towards sustainability; and d) engagement of
UPM community in sustainability endeavors.

Given that this paper is focused on the relationships among itdUPM and other actors, two case studies that could be framed on the two upper cells of the model (“a” and “c”) are presented. The first is related with the construction of a physical space appropriated to foster a sense of interdisciplinary community. The second corresponds to the multiactor environment that, from the very beginning, itdUPM aimed to create.

Case 1. Designing a physical space appropriate for an interdisciplinary community.

The refurbishing of itdUPM’s main building, has relied upon an open collaborative model that involves public agencies, private actors, members of the educational community and society working together proactively to address sustainability challenges through technology-based social innovations. Bursztyn (2014) points out that “implementability” (or conditions that enable the change process towards the practical realisation of genuine interdisciplinarity) cannot rest on “top-down” institutional agreements; but, they require a process of integration (Bursztyn & Drummond, 2014).

The itdUPM space (see Fig. 3) attracted a vibrant community of voluntary UPM faculty and students, as well as external professionals and entities, developing multidisciplinary technological research projects and transdisciplinary sustainability projects.

The building not only serves as the headquarters of the itdUPM but also as an open demonstration space devoted to spreading technologies and innovations for sustainability. Concepts and prototypes for urban agriculture, decentralised energy systems and the circular economy, among others, are being tested there. In parallel, scientific and dissemination activities are taking place inside the building.

This facility eases multi-actor relationships and the interchange of experiences with the large number of social innovation spaces promoting citizen’s involvement that are currently emerging in Spain and elsewhere.

The itdUPM is now being planned to be enlarged by the creation of a multi-actor “living lab” consortium, including private firms, the Madrid City Council and a number of UPM research laboratories, implying thus an extension of its physical space and sustainability influence.

Fig. 3: itdUPM’s main building.
The itdUPM is at the centre of other projects and initiatives, such as a Master’s program on sustainable development, a Chair between itdUPM and Iberdrola, one of the main technological companies in Spain, and the strategic relationship with a Brazilian Foundation aimed at promoting access to basic services in semiarid areas (IABS).

The site is located at the heart of the main UPM campus (Moncloa Campus of International Excellence) and provides a space for experimentation with sustainable technologies. Drawing on overarching biodiversity concepts, a design and applied research process relating air pollution, urban agriculture and recycled building materials was developed. Moreover, a sustainable sensor system was designed and implemented\(^1\).

The itdUPM building was awarded second prize for its bioclimatic and experimental design within the “Design” category at the World Green Infrastructure Congress 2016 held in Bogotá (Colombia) in October 2016\(^2\).

A recognition was also received by ISCN and the Global University Leader Forum (GULF) for the process of designing and constructing the itdUPM building. This process was presented as a best practice for achieving sustainable campus operations and integrating sustainability into research and teaching in the report “Educating for Sustainability” (ISCN, 2017) which was shared at the World Economic Forum in January 2017.

**Case 2. Universities as facilitators of multiactor partnerships. Alianza Shire**

The itdUPM also collaborates with external private and public entities with a transdisciplinary approach, articulating knowledge and capacities of diverse actors, including local and international actors, in order to solve sustainability societal problems.

At the end of 2013, an exploratory study on public-private partnerships in the humanitarian sector, carried out by the Spanish Agency for International Development Cooperation (AECID) and the itdUPM, confirmed that the limited access to energy at refugee camps hinders the provision of basic services for this population (according to UNHCR, 90% of refugees have not appropriate access to energy and lighting services). Moreover, it also showed that there was a significant interest by the private sector to contribute to improve this situation applying its operational capacities and technical knowledge.

After this study and a careful process of evidence-based analysis, it was decided to face this wicked problem through a multi-actor partnership. The partnership “Alianza Shire”, established in 2014, is an example of a successful collaboration of different stakeholders who worked together in a difficult context of refugee camps.

Alianza Shire is composed of a group of three leading companies in the renewable energy and lighting sector -Iberdrola, Philips and Fundación Acciona Microenergía-, the Technical University of Madrid, and the AECID, in collaboration with the United Nations Refugee Agency (UNHCR) and the Norwegian Refugee Council as implementing partners.

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\(^1\) [http://www.itd.upm.es/a-collaboration-model-for-the-innovation-in-sustainable-development/?lang=en](http://www.itd.upm.es/a-collaboration-model-for-the-innovation-in-sustainable-development/?lang=en)

This partnership was institutionalized as a platform (not as a project) aimed at offering innovation and knowledge services to the humanitarian community.

During last year, Alianza Shire developed a pilot solution that combines technological and managerial innovations to solve the energy challenge in three refugee camps in the North of Ethiopia.

This pilot project is a demonstrator designed to be scaled up. Its first intervention covered the improvement and extension of the electricity grid in this camp and includes installation of protection devices at the communal services, rehabilitation of equipment and connection to new services, such as the primary school, two communal kitchens or markets hosting 36 small businesses. Furthermore, 63 LED luminaries were installed as public street lighting covering a distance of more than 4 km.

The estimated effect of the intervention is very positive, since it is not only improving life and security conditions in the camp, but also avoiding collection of around 1,500 tonnes of firewood and emissions of 2,000 tonnes of CO$_2$ per year. In economic terms, a saving of 30,000 EUR in diesel consumption was calculated.
The solution developed by this pilot is now serving as a model for replication and/or scale-up in other refugee locations.

Beyond the traditional “extractive perspective” (institutions should support a university that works for sustainability), the iTdUPM has developed a mutual reciprocity perspective: Universities and other institutions need each other to address problems that affect all of them. A work in partnership allows coordination of material, financial and in kind resources (at cost price) but also other resources such as knowledge, skills, human resources, capacities and contacts.

Over the last two years of joint work, the clear vision and institutional commitment of each partnership organisation was crucial. It enabled the efficient implementation of the pilot project despite the challenges of a context with these characteristics.

It was crucial to clarify, from the starting point, implications of working in partnership (risks and benefits shared by all members), and in the humanitarian sector (volatile and demanding contexts).

The Alianza Shire provides a good example of the way that external relationships can be built with companies, international organizations and NGOs which are totally different to usual academic activities. In this sense, the iTdUPM also played an important driver, facilitator and integrator role, strengthening the University’s capacities in finding innovative solutions to contribute to achieving the Sustainable Development Goals.

The process of stakeholder engagement in the ecosystem developed by iTdUPM was based upon the progressive integration of internal members from UPM along with external professionals and entities. As the collaboration of each affiliate was voluntary, the degree of engagement was diverse and flexible.

**Discussion of the two case studies**

The iTdUPM collaboration model is promoting cultural change in an traditional university through community engagement across different areas. It was conceived by a small group

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<td>Camp security</td>
<td>Reduction of 60% robberies</td>
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<td>Deforestation</td>
<td>Reduction of 1,500 Tn/year in firewood collected</td>
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<td>CO2 emissions</td>
<td>Reduction of 2,000 Tn/year in CO2 emissions</td>
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<td>Economic</td>
<td>Savings of 30,000€/year in diesel purchase</td>
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<td>Gender-based violence</td>
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of UPM personnel supported by UPM’s senior management who successfully implemented the UPM strategic sustainability initiative in the following three areas: (i) the creation of a multi-actor centre (itdUPM); (ii) the refurbishing of an old building for interdisciplinary research and co-creation purposes; and, (iii) the development of a range of external projects where several faculty, researchers, and students are working together in a transdisciplinary way (such as the Alianza Shire).

The itdUPM is a UPM’s core initiative for sustainable development and the achievement of the Sustainable Development Goals (SDG). The main differences from other projects in the university are as follows:

- Traditional university activities and projects are disciplinarily-oriented, but the itdUPM model has a transdisciplinary orientation.
- In contrast to the traditional hierarchical structures of UPM, itdUPM is organised as a horizontal network that includes UPM personnel as well as external individuals and entities.
- itdUPM members are affiliated and participate in specific itdUPM activities on a voluntary basis rather than rigidly belonging to Schools and Departments.
- The main motivation for itdUPM affiliates is participation in sustainability activities working in a transdisciplinary way. Traditional incentives such as money and academic results are less important for affiliates.

The “low-cost multi-actor collaboration” model developed by itdUPM, is adaptable to a range of universities with different backgrounds because: (i) it is based upon a bottom-up process driven by UPM personnel with support from UPM senior management; (ii) it implies an evolutionary process from an initial “niche” towards an extended “regime”; (iii) it takes advantage of the university’s human resource capacities and integrates these with external competencies; and (iv) it uses initially scarce financial resources and progressively generates additional resources.

To replicate this model, it is critical to generate an ecosystem that draws upon the privileged role that the university has in society. In this respect, universities are urged to abandon a service provider approach and, instead, adopt a partnership approach in relation to external entities that promotes a win-win situation for the university and society.

This model is especially adaptable to universities with limited financial resources. It is also important to note that in these cases, dormant intellectual resources that can be awakened towards collaborative sustainability endeavours.

Looking ahead

Having completed its institutional infancy, itdUPM now faces new challenges. A permanent challenge is how to obtain additional financial resources to support management structures required to take care of the network and its ecosystem.

The organisational model based on a horizontal structure will eventually need to be expanded in order to demonstrate that it can be scaled-up without a centralised control structure.

itdUPM’s success may jeopardise the initiative, especially if growing expectations cannot be satisfied, or if the increasing visibility of the Centre is perceived as a threat to dominant
interests.

The most interesting characteristic of the itdUPM is that building on a bottom-up feature that goes beyond the silos culture of departments, it functions as a “connecting tissue” for provoking, accelerating and sustaining transformative collaboration among disciplines (more than 200 researchers and teachers associated), and with other actors (strategic partners in Industry, Public Administration, and NGOs).

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