Design-as-translation and enabling factor in academic entrepreneurship: An analysis of MIT SENSEable City Lab

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Structured Abstract

Purpose – There is an increasing attention on the entrepreneurial dimensions that enable academia to pursue innovation development and commercialization, for example in the form of intellectual asset management, university spin-offs and technology transfer and brokering (Shane 2004a; Wright et al. 2009). The economic revenues generated by these forms of academic entrepreneurship are becoming more and more attractive for higher education institutions in order to develop new revenue value streams and sustain financial viability (Shane 2004b; Wright et al. 2007; Wong 2011). In addition, it is pointed out that academic entrepreneurship plays an important role toward the creation of societal value (Botes 2005). This paper aims to prospect academic entrepreneurship as a way to connect academia with external stakeholders in order to jointly create value (Kingma 2011). The stakeholders’ value network centred on academic entrepreneurship can respond to different wants and needs, not necessarily aligned, and focusing on various forms of value to be created. The holistic integration of such value network is a key issue. This paper draws insights from the investigation of how SENSEable City Lab – an academic lab nested within the Department of Urban Studies and Planning at MIT (Massachusetts Institute of Technology, USA) - uses design as a translational mechanism to connect and align different stakeholders in the process of value creation in academic entrepreneurship. Design materials such as sketches, data visualization and interactive prototypes are used at various stages to coordinate the stakeholders: through the design process, ideas and concepts undergo semiotic translations and are materialized into visual, audio, tangible formats. Design can even be employed to facilitate participatory design session where all the stakeholders directly contribute to the design process, jointly creating visual representations and prototypes (Simonsen and Robertson 2013).
**Design/methodology/approach** – The study is the result of an investigation - also based on ethnographic methods – conducted over a period of 4 years (2011-2014) at SENSEable City Lab of MIT (USA). This research methodology to investigate a real case study has proven to be an appropriate method to investigate particularly complex phenomena that require a direct involvement of researchers in the field (Czarniawska 2012).

**Originality/value** – This paper analyses the role of design-as-translation and enabling factor in academic entrepreneurship. This is a perspective currently under-investigated in design research.

**Practical implications** – Design can play a relevant role in supporting entrepreneurial activities in academia. These entrepreneurial activities are nowadays particularly important, especially at a time when in most countries public funding for academic institutions is decreasing.

**Keywords** – Academic entrepreneurship, design, translation, knowledge economy, Entrepreneurial University, stakeholder.

1. **Introduction**

Most scholars are interested in that entrepreneurial dimension that allows academia to pursue innovation development and commercialization, for example through intellectual asset management, university spin-offs and technology transfer and brokering (Shane 2004a; Wright et al. 2009). The economic revenues generated by these forms of academic entrepreneurship are nowadays very important in terms of business models and financial viability for higher education, especially considering that in some contexts the access to government funding has become harder (Shane 2004b; Wright et al. 2007; Wong 2011). Whilst not necessarily denying the importance of these economic outcomes, some other scholars argue for a view of academic entrepreneurship also oriented toward creating societal value (Botes 2005). Economic outcomes - such as new jobs created by university spin-offs or the amount of taxes they pay - are important contributions, but in a wider perspective these data should be integrated by looking at the impact of academic entrepreneurship also in terms of environmental sustainability, liveability, social equity and so forth.

The interplay between academia and external stakeholders such as industry, NGOs, government institutions is of paramount importance to generate value. Value precisely emerges through joint collaborative endeavours, where these different stakeholders bring together their assets, competences and specificities. In these joint endeavours, the knowledge produced in academia, scientific organizations and private research labs plays a crucial role for entrepreneurial innovation (Stam and Garnsey 2008).

The problem is that sometimes these stakeholders have different needs and interests, speak different languages and might not be aligned in terms of which kind of value has to be created. Activists from an NGO, venture capitalists and academic researchers involved into a joint project might have divergent interests: the academic researchers might want to
further develop their scholarly investigation; the companies might see the potential of the project in terms of pure economic revenues and might want to patent some of this technology and market it; the NGO might instead be interested in releasing the results of the project as open source and open access in order to maximize societal benefits. These diverse notions of value can be complementary or in conflict, agreed upon or contested by the stakeholders.

Framed in the above premises, this paper investigates how in the SENSEable City Lab – an academic lab nested within the Department of Urban Studies and Planning at MIT (Massachusetts Institute of Technology, USA) – design-as-translation is used as enabling factor to support academic entrepreneurship and its processes of value creation. More specifically, the case study builds upon a perspective that praises the potential of entrepreneurship as a way to connect academia with external stakeholders to jointly create value (Kingma 2011).

The remaining of the work is organised as follow: Section 2 introduces the literature background around the topic of academic entrepreneurship and design as translation. Section 3 describes the research approach and the research context. Section 4 presents the findings of the study. Section 5 elaborates on the results and concludes the paper.

2. Literature review

2.1 Academic entrepreneurship

Academic entrepreneurship is a multi-faceted concept, which has been analysed from different perspectives. Some studies (Rothaermel et al., 2007; Gibb et al., 2013) consider the entrepreneurial university as an **entrepreneurial organization** with a key role within the innovation system, both as a human and a technology capital provider (Rosenberg and Nelson, 1996; Mowery et al., 2001). Other studies (Oakey and Mukhter, 1999) see the entrepreneurial university as source of potential global start-ups especially in high-tech sectors. According to Rothaermel et al (2007), academic entrepreneurship refers to activities and assets of an entrepreneurial university, such as technology transfer, university licensing, science parks, incubators, university spin-offs, and other processes aimed to implement the third mission of the university (social and economic development). Other authors interpret academic entrepreneurship in terms of businesses started by academia as university spin-offs (Shane, 2004; Wright et al., 2009). More detailed taxonomies include the **research-based entrepreneurship** (Goel and Grimpe, 2011) or businesses started on the basis of academic research and technology. Moreover, academic entrepreneurship is defined as a practice performed with the intention to transfer knowledge between the university and the external environment in order to

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1 We use the term stakeholder in a broad sense (Freeman 2010), as to include all the actors that somewhat affect or are affected by a specific process or project or organization. In design, Klaus Krippendorff provided the following definition: “Designers are surrounded by intelligent professionals who have an interest in the outcome of a design process: clients, engineers, CEOs, financiers, sales people, and the members of institutions that provide data in preparations for a design or do research after prototypes are available” (Krippendorff 2006, 63).
produce economic and social value both for external actors and for members of the academia (Cantaragiu, 2012).

Currently, academic entrepreneurship includes a large spectrum of entrepreneurial activities: large-scale science projects, creation of technology park, contracted research, consulting, patenting/licensing, spin-off firms, industry training courses, publishing academic results, producing high qualified graduates (Klofsten and Jones-Evans, 2000).

From these definitions and models an awareness about the important role covered by the external actors (stakeholders) arises, as well as the increasing accountability and responsiveness of higher education institutions in their environment (Maassen, 2000).

These elements characterize the envisioning of a new archetype of university, the Stakeholder University (Romano, 2009), which promotes learning and capability building processes among globally distributed and integrated networks of heterogeneous stakeholders (employees, customers, suppliers, partners, academics, professionals, and independent learners) (Margherita and Secundo, 2011).

The central drive of academic entrepreneurship is linked to the transfer of knowledge in a more direct way between the academic world and the external environment through the production of appropriately skilled human capital, the transfer of technology from academia to industry, the creation of frame-breaking basic knowledge and the generation of spin-out companies located in the surrounding territories (Lazzeroni and Piccaluga, 2003). While interaction between the institutional spheres of industry and academia is not a new phenomenon (Etzkowitz, 2001; Shinn, 2002; Martin and Etzkowitz, 2000), the manner in which these interactions are unfolding is new.

Among the challenges of university–industry collaboration, Chiesa and Piccaluga (1998) note that given the different objectives and languages prevalent in academic and industrial contexts there is also a need for translators between these groups. Consequently, it is necessary to recognize and balance the differing objectives of each stakeholder, thus ensuring that the needs of stakeholders are addressed systematically (Garrett-Jones et al., 2005; Fogelberg and Sanden, 2008).

2.2 Design-as-translation

This paper builds upon a concept of translation that goes beyond its common use (i.e., the translation of a literary text from English to another language). This view sees translation in light of its semiotic dimension and highlights both the interpretive component of translational processes and their generative, creative potential. Translation can also refer to processes where, for example, a sketch or a visual diagram translate some complex, technical ideas developed by some researchers in nanotechnologies into a format that is easier to understand for non-professional, non-academic audiences; or a situation where a prototype for a tablet for children is jointly created during a participatory design session, where designers, engineers, parents and their children, educators and entrepreneurs work at the same table for a few hours, brainstorm about ideas, needs and desires and create a paper prototype of the tablet.

During these design processes, ideas, concepts, requirements, needs, interests of multiple stakeholders undergo semiotic translations and are materialized into visual,
audio, tangible articulations. We define design-as-translation as a process of articulation, where the articulations emerging from the process of design can be, for example:

- visual articulations, in the case of sketches, diagrams, visual interfaces;
- or material and tangible articulations, in the case of prototypes;
- or other forms of articulations based on one or multiple dimensions (visual, music, video, photography, performance, textual descriptions or stories).

In particular, we propose to use the concept of design-as-translation to represent the process of creating and presenting these design-based semiotic translations to multiple stakeholders: In the case of design, the stakeholders can be defined as all the subjects affected by the design process. In the example of the tablet for kids, stakeholders are – among others - children, their parents and relatives, designers, the people who will manufacture and distribute the tablet, key opinion leaders, experts and institutions in the field of education, and many others. These stakeholders speak different languages and have different needs, desires and agendas. In order for them to productively work together and to jointly create value, it is important to get to a level of alignment, coordination and understanding.

The concept of translation is not new in design research. Some scholars employ it in a quasi-literary sense, to talk about translational processes among the languages of different design methods or techniques, such for example Vishal Singh and Ning Gu, who investigate generative design in architecture (Singh and Gu 2012). Some other scholars adopt translation in another quite commonly used connotation, as to describe design processes and outcomes (such as sketches) in terms of ‘translation of ideas’ (see for example: Do et al. 2000; Leblebici-Başar and Altarriba 2013). Anne Tomes et al. focus on the negotiation between graphic designers and the clients and claim that "viewed in this light, the whole of the design process is directed towards the achievement of a mutually acceptable visual 'translation' of the brief, and it is achieved through the medium of lesser translations from the verbal to the visual and back again" (Tomes, Oates, and Armstrong 1998, 127).

None of these studies specifically addresses the relationship between design-as-translation and entrepreneurship.

3. Research approach

In this article, we precisely investigate how design is used as a translation mechanism to align multiple stakeholders in some academic entrepreneurship activities. The study is the result of an investigation - also based on ethnographic methods – conducted by one the authors in the last 4 years (2011-2014) within the SENSEable City Lab located at MIT in Boston USA. The application of an ethnographic approach with the direct involvement of researchers in the field has proven to be a common element of a good number of recent studies on organizations (Czarniawska 2012).

In operational terms, data are collected through archival research, direct observation, the authors’ experience as participant and e-mail exchanges. Field source data mainly consists of notes, photographs and audio-video recordings. Some semi-structured
conversations with the labs’ directors, members and internal and external collaborators in the period across January 2011 and April 2014 have been conducted by one of the authors. Further details on the overall methodological approach are provided in (Simeone 2014).

In order to examine the various instances of design-as-translation at play in SENSEable City Lab, we build upon a categorization of translation modes offered by Umberto Eco (Eco 2003). The categorization we offer is inspired from Diedrich’s work (Diedrich 2013).

In order to build his categorization of translation modes, Eco relies on 2 macro concepts:

- **Infrasystemic interpretation**: it is a translational mode that happens within the same semiotic system. Infrasystemic interpretation occurs for example when I have an original text in English and create a summary or a paraphrasis of it in English.

- **Intersystemic interpretation**: it is a translational mode that happens within different semiotic systems (e.g., a translation between two different languages such as English and Italian or an adaptation from a novel to a movie).

These categories will now be used to describe the translational processes commonly employed by SENSEable City Lab.

### 3.1 The research context

SENSEable City Lab is a research group nested within the Department of Urban Studies and Planning at MIT. SENSEable City Lab’s projects span from architectural interventions, to innovative product design, or to future sensing technologies, such as TrashTrack, an initiative that used hundreds of small location aware tags to track different types of trash to reveal the final destination of our everyday objects.

In 2011, the SENSEable City Lab had been operating for 7 years and had already worked on more than 50 projects with roughly 350 collaborators. Projects are also widely distributed in different geographic locations across all the continents. A high number of stakeholders are involved in SENSEable City Lab’s projects and some of them came from different disciplinary perspectives and cultural viewpoints and have various agendas, needs and interests.

In terms of academic entrepreneurship, SENSEable City Lab is pretty active across several dimensions:

- In some cases, research projects are oriented to the design and development of technologies or models that can have a commercial potential.

- In some other cases, these research activities led to the creation of start-ups, such for example Superpedestrian, which produces and commercializes The Copenhagen Wheel, a digitally-equipped bike that contains sensing technologies

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1 Figures collected from an analysis of SENSEable City Lab official website (http://senseable.mit.edu/) and personal conversations with lab’s directors and members carried out in Cambridge MA (USA) in March 2011.
and that is able to offer real-time advice to the biker on matters such as traffic, weather and pollution conditions\(^1\).

- In most cases, research activities are backed and funded by external sponsors, from Coca-Cola, to ENEL, GE and many others. Outcomes of these collaborations are models or prototypes, which can be evaluated by industrial partners as potential technologies to be implemented.

### 4. Findings

#### 4.1 SENSEable City Lab and its translational modes

Following Eco’s categorization, we can analyse how SENSEable City Lab uses design to operate translational processes among different categories of stakeholders, so improving academic entrepreneurship.

(a) Intrasystemic interpretations

<table>
<thead>
<tr>
<th>Mode of translation</th>
<th>Examples in SENSEable City Lab</th>
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<tbody>
<tr>
<td>Intrasemiotic: e.g., a copy of a drawing with a different scale</td>
<td>Operating within the architectural domain, SENSEable City Lab frequently works with maps and models at different scale. Most of these models are kept at the lab and visitors/team members can interact with them also after the conclusion of the project. Stakeholders involved: internal team members, colleagues, visiting researchers, external collaborators.</td>
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<tr>
<td>Intralinguistic: e.g., the summary of a book or a paraphrasis of a sentence</td>
<td>The lab frequently produces a wide variety of written publications, which present its projects to different audiences, different channels and using a different language. SENSEable City Lab’s members also put great effort in disseminating (or marketing) their work, by systematically creating dedicated websites (or microsites) for each project, creating press kits and press releases, actively communicating on Facebook, Twitter and other social media channels. <strong>Stakeholders involved:</strong> internal members to external collaborators and sponsors, up to press representatives and general public.</td>
</tr>
<tr>
<td>Performance: e.g., two different actors reading the same text</td>
<td>The senior members of the lab frequently give keynotes or public lectures. In some cases, the same Keynote or PowerPoint slides are used and different speakers - sometimes the lab's director, some other times other lab members - present these same slides. <strong>Stakeholders involved:</strong> wide, but selected audience, depending on the presentation (e.g., the same PowerPoint slides can be used for a keynote at a scientific conference or for a TED Talk).</td>
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</tbody>
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(b) Intersystemic interpretation with substance variation

\(^1\) https://www.superpedestrian.com/ accessed 27 March 2015.
Intersemiotic interpretations: e.g., a photo of a painting

This can be the case of sketches that translate other sketches, such as for example in some brainstorming sessions at SENSEable City Lab where some of the participants draw sketches and some other participants answer elaborating other sketches that translate the original one (for example, representing the same concepts from a different perspective). In these occasions, sketches are used to translate ideas and concepts among different stakeholders.

**Stakeholders involved:** internal team members, colleagues, visiting researchers, external collaborators.

Interlinguistic interpretations: e.g., the translation of a novel from English to Italian

Some of SENSEable City Lab publications are translated in multiple languages, especially those books for trade, which illustrate specific projects, such as the *Digital Water Pavilion at Zaragoza* (Nicolino and Ratti 2008) published in Italian, French, Spanish and English. Also in light of the geographically distributed activities of SENSEable City Lab, this mode of translation is important to further disseminate and market the results of the lab.

**Stakeholders involved:** geographically distributed academic community, but also companies working in the design field (architects, urban planners, etc.).

Adaptation: e.g., a novel becomes a movie, or some pieces of classical music become a cartoon, like in the case of Walt Disney's *Fantasia*.

SENSEable City Lab frequently produces videos that illustrate the key components of its projects. Some of these videos, posted on the YouTube channel of SENSEable City Lab got hundreds of thousands of view and got frequently re-posted and linked from other websites, activating viral dynamics.

**Stakeholders involved:** wide audience, from internal members to external collaborators and sponsors, up to press representatives and general public.

Adaptation as new work: e.g., a novel that tells the story of Scarlett O'Hara after she says "After all tomorrow is another day" at the end of the movie *Gone with the Wind*.

Projects created by SENSEable City Lab are all connected by some sort of overarching thematic orientation, such as the idea of smart cities or city operating system. In some specific cases, the projects are also further connected by a common storyline.

**Stakeholders involved:** wide audience, from internal members to external collaborators and sponsors, up to press representatives and general public.

The use of all these translation modes from SENSEable City Lab and the efforts invested in creating prototypes, videos, performances and publications for multiple audiences give an idea of how important it is for the lab to communicate/interact/exchange ideas and collaborate with external stakeholders. Design-as-translation helps SENSEable City Lab in translating the conceptual and technological complexity behind its activities into forms, which are more accessible to stakeholders with a different academic or technical background.

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2 The Copenhagen Wheel got 841,413 views in 4 year, Flyfire 405,204 views in 4 years (figures collected 28 July 2014)
5. Discussion and conclusions

5.1 Design-as-translation as enabling factor in academic entrepreneurship

The semiotic categorization has been used as a framework for the investigation for two reasons:

• To show how the concept of translation can be further expressed into categories, which give the opportunity to segment the processes of design-as-translation
• To show the extent of the process of design-as-translation in SENSEable City Lab.

We will now reflect upon how these processes of design-as-translation can be used as enabling factor to support academic entrepreneurship in the forms expressed in the literature background and its processes of value creation.

<table>
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<th>Mode of translation</th>
<th>How different modes of translation enable academic entrepreneurship</th>
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| **Intrasemiotic:** maps and architectural models or models for new products, created at various phases of the projects. | • Aligning internal lab members and external collaborators, thus leading to better team coordination.  
• Models are also a way to translate early ideas into formats, which can be shared with external investors and sponsors. |
| **Intralinguistic:** a wide variety of written publications, which present projects to different audiences, different channels and using a different language. | • Translating the labs’ scientific results and activity – oftentimes originating from state-of-the-art advancements in fields such as nanotechnologies or robotics – into a format that can be easily understood by wide audiences.  
• As such, it is not uncommon that SENSEable City Lab’s projects get mentioned in press and media outlets, such as Wired, TIME, CNN, Fast Company.  
• This helps the dissemination and marketing activities of the lab and its ‘brand’. An external sponsor might be more interested in investing into the lab, if there are chances that the joint project is going to be featured on a TV show or an internationally distributed magazine. |
| **Performance:** the lab members frequently give public presentations in several venues, sometimes also adding a performative dimensions (such as in a talk for TED). | • The presentations developed for keynote addresses, invited lectures and seminars are generally oriented to different targets, depending on the type of event: from an academic conference, to a technology fair for industry, up to a TED talk.  
• These presentations are ways to translate and summarize the lab’s activities into a 15-30 minute easy-to-understand talk.  
• These venues are a good way for the lab members to create and curate connections and forge alliances, within and beyond academia. |
| **Intersemiotic interpretations:** the lab frequently uses design artifacts – sketches, visualizations and early prototypes - during | • Design artifacts are frequently used in brainstorming sessions, which see the participation of teams that are distributed in diverse organizations and different geographic locations.  
• Design artifacts translate ideas into formats that can more easily circulate across these organizations and locations, |
Interlinguistic interpretations: in some cases, SENSEable City Lab documented his projects through some books translated in multiple languages.

- These multilingual translations give an idea of the geographic articulation of the lab and its way of operating, also involving actors that might not be comfortable with reading/speaking in English.
- The lab also has sponsors located in countries where English is not the main language: e.g., Spain, Germany, France, … This collaboration is in itself something that some sponsors consider qualifying for their own brand and therefore they tend to use it in their communication activities.

Adaptation: SENSEable City Lab frequently produces polished and professionally crafted videos that illustrate the key components of its projects.

- Professionally shot short videos and motion graphics animations are generally produced by the lab and distributed through social media channels (such as Youtube).
- These videos are important translation mechanisms because:
  - They document the project in a format that is engaging and visually appealing
  - They can be easily understood also by an audience of non-professionals
  - They can be easily re-shared. This is an incentive for the sponsors to activate partnerships with SENSEable City Lab.

Adaptation as new work: some SENSEable City Lab’s projects – such as ‘MoMA-followup’ – can be seen as adaptations of previous work, which is translated in a way that can travel to different contexts, in this case an art exhibition.

- SENSEable City Lab works in a way that his research and development activities are translated into multiple ways, from an academic paper to an artwork to be exhibited at a Museum of Modern Art in New York.
- This is a way for SENSEable City Lab to strategically position itself as a lab that operates across the borders of academia.

5.2 How does design-as-translation support value creation in academic entrepreneurship?

The previous paragraph showed how design-as-translation works as enabling factor in academic entrepreneurship:

- Coordinating and aligning the lab’s internal team members and the external collaborators and stakeholders
- Streamlining research, concept and development processes
- Creating a strong brand and a clear strategic positioning for the SENSEable City Lab
- In terms of marketing and communication, presenting the activities of the lab to a wide variety of audiences in an engaging way
- Forging and managing connections and alliances

All these elements support academic entrepreneurship in processes of value creation.

This paper analysed the role of design-as-translation as enabling factor in academic entrepreneurship. This is a perspective that needs further investigation in design research,
also considering that these entrepreneurial activities are nowadays particularly important, especially at a time when in most countries public funding for academic institutions is decreasing.

References


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1 According to the National Science Foundation, from 2002 to 2012 in the US “per-student state support to major research universities dropped by an average of 20% in inflation-adjusted dollars” (http://www.nsf.gov/statistics/seind12/c8/c8s2o29.htm, accessed 28 December 2014).


Lazzeroni, Piccaluga, A., 2003. Towards the entrepreneurial university. Local Economy 18(40), 44.


Romano, A., (2009) Open Business Innovation Leadership: The Emergence of the Stakeholder University, Palgrave, UK.


