

A MULTIDIMENSIONAL FRAMEWORK FOR INNOVATION TYPOLOGY: THE CASE OF MOROCCAN ENTREPRENEURS

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ABSTRACT

Policy makers need a thorough understanding of innovation dynamics within their local contexts to be able to devise the proper strategies for innovation capability building among entrepreneurs. While there is a nascent entrepreneurial ecosystem in Morocco, there is a lack of startup's innovation research. In this paper we intend to make both a conceptual and empirical contribution.

From a theoretical background, innovation, as a concept, is very versatile. With a rich and fragmented corpus of innovation definitions classifications and types, it becomes important to develop a clear and a comprehensive overview of innovation typologies and their underlying dimensions. In this paper, we suggest, through a literature review, a multidimensional approach for the analysis of innovation typologies. Three clusters of dimensions have been identified for the classification of innovations: Innovation Intensity, Innovation Scope, and Innovation Depth. This framework addresses three families of questions: What is its degree of newness? What's the nature of the innovation? Where does it occur in the ecosystem?

From an empirical perspective, this construct has been applied to a panel of 13 Moroccan entrepreneurs to discuss the types of innovations introduced by their startups. The strong interplay between disruptive and incremental innovation, the diversity of innovation scope with a dominance of product and business model innovation, the national emphasis with limited international impact are the main findings of this qualitative study.

While there is lack of research on innovation at the enterprise level in Morocco compared with research about ecosystem, this work lays down some foundations for the study of innovation at the enterprise level and constitutes the first step for further research to understand Moroccan startup innovation capability. Ultimately this new stream of research in Moroccan startup innovation field will help entrepreneurs and policy makers in their innovation capability building efforts.

Keywords: Entrepreneurial Ecosystem, Moroccan Entrepreneurs, Incremental Innovation.

INTRODUCTION

Innovation has been recognized as the main driver of entrepreneurial activity (Schumpeter, 1942; Drucker, 1985). Policy makers need a thorough understanding of innovation dynamics within their local contexts to be able to devise the proper strategies for innovation capability building for entrepreneurs. In Morocco, there is a nascent entrepreneurship ecosystem and several initiatives to encourage innovation among entrepreneurs. However, as far as we know from the literature search, there is a lack of in-depth research on startups' innovation in this developing country.

From a theoretical viewpoint, it is important to recognize innovation ambidexterity in order to conduct in-depth research. Innovation concept has been addressed from different research fields and through various constructs such as innovation typologies (Choffray & Dorey, 1983; Garcia & Calantone, 2002), innovation process models (Tidd et al., 2006), innovation measurement (Adams et al., 2006; OECD, 2005), innovation determinants and outcomes (Becheikh et al., 2006) to cite few. This results in different conceptualizations and some divergent research results (Becheikh et al., 2006; Garcia & Calantone, 2002). In the last two decades, we note the rise of a new stream of systematic research working towards the elaboration of more holistic innovation frameworks (Becheikh et al., 2006; Garcia & Calantone 2002; Crossan & Apaydin, 2010). Innovation typology in particular has been approached from various angles generating multiple innovation categories and analytic dimensions making research results difficult to exploit by managers (Garcia & Calantone, 2002). The literature has also produced different terminologies to designate the same types of innovations (Adams et al., 2006; Garcia & Calantone, 2002).

In this paper we will provide a literature review on innovation typologies and suggest a new multidimensional framework for the analysis of innovation types. We apply this construct on a panel of Moroccan startups to discuss different innovations introduced by the founders.

LITERATURE REVIEW

In the following sections, we will synthesize some of the main typologies we have identified and selected from the literature review without attempting to be exhaustive, which is not the aim of this paper.

Beyond Product Innovation

Drucker (1985), defines the innovation as any change opportunity that can lead to new activities or new services in a broad sense. There is in fact a very large innovation scope covering new products, methods of production, sources of supplies, markets, and new industrial organizations (Schumpeter, 1942). This classification, widely used in the literature, has given rise to subsequent and nuanced categorizations. The recognition of various forms of innovation has evolved through history. The Oslo Manual (OECD, 1997) was initially limited to Technology, Product and Process innovation (TPP) before extending to non-technological innovation such as service innovation, marketing and organizational innovation in (OECD, 2005).

Francis & Bessant (2005) suggest a “4Ps” model based on 4 categories of innovations: i) Product; ii) Process; iii) Position i.e. a change to the context or the positioning of the product ; and iv) Paradigms i.e. a change in the business model. In our point of view, this model, compared to similar classifications, has the advantage of making sense of business model innovation which has gained in importance with the development of Internet and information technologies and the rise of born global firms.

Product innovation has been addressed with further sub-classifications. Choffray & Dorey (1983) identified three categories: i) Repositioned product: a change in the product market positioning. ii) Reformulated Product: an innovation in product technical or functional characteristics iii) Original Product: disruptive products introducing a change not only in terms of characteristics but also in terms of user perception and market positioning. This classification considers the user perception of the innovation as an important dimension. This emphasizes the

fact that newness is a perception related to the observer, would it be a customer, an enterprise, a market or the world (Tidd et al., 2006). (Fernez-Walch & Romon, 2006) consider the various innovations possible in all dimensions of the marketing mix: product, price, place and promotion. This is in line with the definition of commercial innovation and marketing innovation described in Oslo manual (OECD, 2005) and the market innovation in the definition of Schumpeter (1942).

Despite the recognition of these various types, product innovation remains the most widely addressed type in the literature. Contemporary scholars call for more acknowledgment of service, process and organizational innovation as key drivers of competitive advantage (Adams et al., 2006; Tidd & Hull, 2006).

Continuous and Discontinuous Innovation Dichotomy

The Schumpeterian theory identifies two levels of innovation (Schumpeter, 1942): continuous change involving multiple small steps and constant adaptation to new inputs; and discontinuous or “*Revolutionary*” change involving new rules and breaking the established equilibrium in the economy. Discontinuous innovation generates profound changes in the industry and the economy, involves high level of risk and uncertainty and requires high entrepreneurial capabilities (Schumpeter, 1942). Similarly, for Christensen & Overdorf (2000), continuous or “*Sustaining*” innovation is about product or service improvements to respond to “*Evolutionary changes*” in the market whereas “*Disruptive innovation*” is about the creation of a completely new market through the introduction of new kinds of products very different from the mainstream market. Ultimately, these disruptive products might become the new dominant mainstream. Bessant et al. (2005) explain that discontinuous innovations stem from major changes in technology, markets, policy or other frontiers of the “*Established order*”.

While discontinuous innovation is considered as the main driver of economic development in Schumpeterian tradition, some researchers support the importance of continuous innovation with evidence that radical or disruptive innovation accounts for only 6% to 10% of innovation projects and that the cumulated gains from incremental change outpaces those from exceptional and discontinuous change (Tidd et al., 2006).

Between these two streams, we argue that an entrepreneur’s real life is often a combination of these bipolar extremes. It is hence possible to capitalize for instance on a radical innovation as the basis or the “*Platform*” for subsequent incremental innovations as “*Derivatives*” to ensure a return on the heavy investments in the initial discontinuous innovation (Gardiner & Rothwell, 1985).

Innovation Typology: A Multi-Dimensional Concept

The traditional categorization of innovation as radical or incremental is seen as incomplete or too simplistic (Henderson & Clark, 1990; Garcia & Calantone, 2002) and there is a need to take into account the continuum between these two extremes. Garcia & Calantone (2002) developed a tridimensional model mapping innovation according to i) the level of innovation ii) technological versus marketing innovation and iii) newness to the enterprise versus newness to the industry. The model generates three categories of innovation: Radical, Significant and Incremental. Tidd et al. (2006) offer a classification based on the impact of change and whether it involves a specific component, a sub-system or the whole system (the enterprise, the sector, the industry). The literature has produced different factors to study the newness and the perspectives from where innovation is considered. Garcia & Calantone (2002)

identified, through a systematic literature review, at least six perspectives of newness in a set of empirical research from 1979 to 2000: Newness to the world, to the enterprise, to the industry, to the market, to the customer or to the scientific community. Another model from Henderson & Clark (1990), distinguishes innovation at the product component level and innovation at the architecture level. This model introduces two dimensions, i) the innovation's impact on products components ii) the impact on the linkages between components. This model enhances the dichotomy incremental/radical by recognizing intermediate level innovations such as modular innovation and architectural innovation.

We can see from this few examples that most of innovation typology models include a dimension about the degree of innovation, but they are very different when it comes to the other dimensions involved. The factors used to identify innovation types don't have the same reach and depth in the research leading to fragmentation and difficulty to make use of the results.

METHODOLOGY

We conducted a thematic classification through four analytic steps followed by a qualitative study.

1. Literature review: we selected innovation typology models from a number of sources (Table 1) : i) Foundational theories such as Schumpeter and Christensen, ii) the OECD guidelines for innovation research based on the most influential research on the subject, and iii) systematic literature reviews and innovation frameworks.
2. Identification of explicit analytical dimensions from multi-dimensional matrixes and implicit dimensions from innovation definitions and categorizations. Table 1 is a thematic grid of innovation types by authors. Dimensions are highlighted in column 3.
3. Clustering: The analytical dimensions were grouped into three coherent clusters (Table 2). Column 2 lists the dimensions considered in each cluster.
4. Modeling (Figure 1): the results were synthetized into a comprehensive framework, using typical questions to operationalize each concept.

Authors	Innovation Types	Dimensions
Schumpeter (1942)	Continuous/Discontinuous	Level of change
Schumpeter (1942)	Product/ Process production methods/market/Industrial Organization	Innovation categories
Christensen & Overdorf (2000)	Continuous/ Disruptive	Level of change
Bessant et al. (2005)	Continuous/Discontinuous	Level of change
Tidd et al. (2006)	Incremental/Radical	Level of change
Gardiner & Rothwell (1985)	Platforms/Derivatives	Level of reuse
Garcia & Calantone (2001)	Incremental/ Radical/Significative « Really New » Technology/Marketing Macro (market, industry)/Micro (enterprise)	Level of change Innovation categories Locus of impact
Garcia & Calantone (2001)	Newness : to the world/industry/market/ customer/enterprise/scientific community	Locus of impact
Francis & Bessant (2005)	Product/Process/Position /Paradigm (Business Model)	Innovation categories
Choffray & Doray (1983)	Repositioned Product/Reformulated	Innovation categories

Authors	Innovation Types	Dimensions
	Product/Original product	Level of Newness perception
Henderson & Clark (1990)	Incremental/Modular/Architectural/Radical	Impact on products components Impact on the linkages between components
OECD (1997:2005)	Technology Product & process/Service/Marketing/Organizational	Innovation categories
Fernez-Walch & Romon (2006)	Local/Global	Locus of impact
Tidd et al. (2006)	Component/Sub-system/System (enterprise, sector, industry...)	Locus of impact

Dimension Clusters	Modalities
Innovation intensity	Incremental/Radical Continuous/Discontinuous Continuous/Disruptive Incremental/Significative « really new » /Radical Platforms/Derivatives
Innovation Depth	Micro/Macro Local/Global Component/Sub-system/System Customer/Market/Industry/Scientific Community
Innovation Scope	Technologic/Non-technologic Product/Process production methods/Market/Industrial Organization Product/Process/Position/Paradigm (Business Model) Technology Product & process/Service/Marketing/Organizational Components/Architecture Repositioned Product/Reformulated product/Original product

For the qualitative research, we conducted semi-structured interviews with 13 Moroccan startups (Table 3) to understand the types of innovations they have introduced using the three clusters and related questions. As an exploratory study, we used conventional sampling with a sample from different fields, startup age, cities and entrepreneurs' profiles (Table 4). To ensure validity and rigor, the content has been audio-recorded and complete transcripts have been produced. Content was coded using the CAQDAS software Nvivo 10. Verbatim were thoroughly analyzed from an interpretative paradigm.

Startup	Description
1	Develops hardware and software solutions for e-gov. services.
2	Provides composting units for agriculture and hospitality sectors to produce energy and fertilizer.
3	Offers a virtual exhibition solution using augmented reality for Real Estate sector.
4	A digital platform for medical appointments and online health.

5	Recycles coffee ground into logs and fuel products.
6	e-commerce and mobile payment platform.
7	A mobile app for smart cities : civic community engagement about environmental issues.
8	Develops payment solutions for banking sector.
9	A testing platform for recruiting IT professionals.
10	A mobile development framework.
11	A digital platform for recruiting interns.
12	Produces construction material from recycled plastic.
13	Broadcasts health content for display at point of care.

Table 4
STARTUPS PROFILES

Startup	Startup's age (years)	Workforce	Founder's Age	Past Experience	City	Sector	Technology field
1	11	60	35-40	yes	Rabat	e-government	IT, IOT
2	5	2	25-30	no	Khouribga, Tetouan	Environment	Renewable energy
3	5	2	35-40	yes	Rabat	Real estate	IT, Virtual reality
4	4	15	35-40	yes	Casablanca	Health	Digital platform
5	1	2	20-25	no	Casablanca	Environment	Renewable energy
6	7	20	35-40	yes	Casablanca	e-Commerce	IT, digital platform
7	3	2	40-45	yes	Marrakech	Environment	Digital platform
8	12	30	40-45	yes	Casablanca	Banking	IT
9	3	1	35-40	yes	Casablanca	Tech Recruitment	IT, digital platform
10	12	10	35-40	yes	Casablanca	Mobile development	IT
11	6	35	35-40	yes	Casablanca	Recruitment	Digital platform
12	2	2	20-25	no	Tangier	Construction material	Recycling
13	5	5	40-45	yes	Casablanca	Health, Advertising	Digital signage

RESULTS

Conceptual Model: A Tridimensional Innovation Typology Framework

After few iterations, three families of innovation dimensions have been identified: Innovation Intensity, Innovation Depth, Innovation Scope (Figure 1).

Innovation Intensity includes all dimensions and scales measuring the degree of change introduced. These dimensions are used in typologies distinguishing continuous and discontinuous change, radical and incremental innovation, disruptive innovations and so on (Schumpeter, 1942; Bessant et al., 2005; Tidd et al., 2006; Christensen & Overdorf, 2000). Used in most innovation typology models, these dimensions are often crossed with other factors depending on the research perspective. This cluster involves questions such as: What is the degree of newness? How much does it impact the status-quo? How big is the level of discontinuity?

Innovation Depth is related to the impact and the spread of the innovation in terms of geography, position in the industry and the frontiers of the innovation. For instance, Tidd et al. (2006) consider the impact from as small as innovation at the level of a single component to as big as innovation at the level of the whole system, where the system stands for the enterprise, the

market or the industry. (Garcia & Calantone, 2002) introduce the concept of innovation at the micro (the enterprise) versus at the macro level (the market or the industry). This cluster implies questions like: Who is impacted by the innovation? Where does the innovation occur in ecosystem? From which perspective the innovation is perceived?

Innovation Scope is related to the nature of the innovation and includes typologies similar to the Oslo manual categories: product, process, organization, marketing (OECD, 2005), and to the initial classification of Schumpeter and the 4 P's of (Francis & Bessant, 2005). Those categories can be further broken down into sub-categories using other analytic dimensions. For instance, Choffray & Doray (1983) identified three product innovation categories, original product, reformulated product and repositioned product. This cluster is related to questions like: What is the content of the innovation? What is new? What is the form of the innovation?

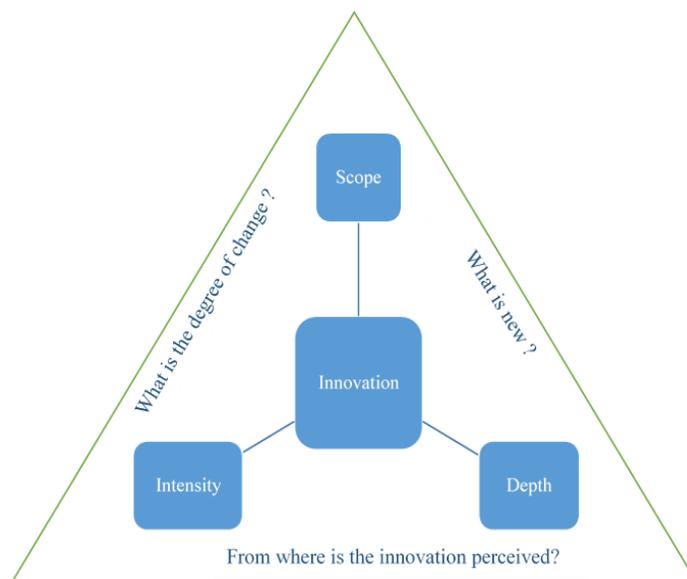


FIGURE 1
MULTIDIMENSIONAL INNOVATION TYPOLOGY FRAMEWORK

In the following sections we will highlight the main findings from the application of this framework on the startups sample by answering three research questions:

- Q1: What is the extent of Innovation Intensity brought by Moroccan Startups?*
- Q2: What forms of innovations do we encounter in Moroccan startup scene?*
- Q3: Where does these innovations occur?*

Innovation Intensity: The Interplay of Disruptive and Continuous Change

Some entrepreneurs (4/13) from the panel have a strong ambition to bring major changes around them. They cultivate a revolutionary vision to change drastically the way it works in their respective industries. They have already undertaken some strategic steps towards disruptive innovations. One of the startups has developed a new platform that changed the way mobile software development was made. This innovation, which is IP protected, seeks to democratize

the mobile development for a bigger number of developers. While most of the Moroccan startups we have been observing during our research tend to develop yet another new mobile application, this startup is positioned in a higher level of innovation intensity scale by making this development even easier for thousands of mobile developers. Another innovative startup, illustrates clearly the disruptive innovation model of (Christensen & Overdorf, 2000). It was launched in an established market of banking and electronic payment solutions. It has changed the technology that was widely used in the industry positioning itself at the opposite of the dominant current in this sector. The startup addressed the need of a niche market initially before being copied by incumbent competitors. Other startups have introduced innovations using existing technologies to revolutionize some traditional sectors such as government services, real estate or healthcare.

While we found evidence of the existence of such discontinuous changes brought by Moroccan entrepreneurs, we identified several continuous innovations occurring at different stages of the startups' life cycle. For the major change makers, we discussed earlier, incremental innovation is considered as a key success factor to keep the competitive edge and to counter the threats of being copied or surpassed by competition. They pursue a continuous research and development or equivalent activities. For most others, the initial innovation is per se an incremental innovation if compared to what exists in the industry. It is meant to create a value added compared to the competition or to substitute solutions and to adapt innovations that have succeeded abroad to the local and national context. The common mindset among those entrepreneurs is to not "*reinvent the wheel*" and to make use of all the available innovations, technologies and models to address local issues.

An interesting finding, from our interviews, is that the questioning proposed in our triad model helped entrepreneurs think about the intensity of their innovations as a large scale beyond the simplistic dichotomy of radical/incremental. In this way they took a broader view of their innovation efforts and they could describe to what extent their innovations had changed the status quo. They realized the intensity of their innovations when they thought about the level of resistance to change, they encountered from the market and the education efforts they had to make to ensure innovations' adoption by costumers.

Innovation Scope: A Diverse Portfolio

This research revealed diverse innovation categories in the panel of startups. 38 different innovations have been cited by the 13 respondents. Unsurprisingly, the product innovation is the most frequent (43%), but business model innovation is also present (23%) followed by process innovation (15%) while marketing and commercial innovation accounts for only 8%. Product innovation stands out naturally when the entrepreneurs describe their respective products, their features and the way in which they differentiate from competition. This includes physical products, software and services, which are often delivered through digital platforms. In certain cases, startups propose a combination of products and services in a packaged solution. We also noted a kind of migration from a product offering model to a service-based model and vice versa. Some startups have initially developed a service but had to commercialize it as product to seize market opportunities or to face constraints.

Business model innovation is significantly present in the panel. There are at least 10 different models identified. Software as a service for banking solutions, a third party for e-gov solutions, the use of hackathons as new commercialization channel, or the cash payment for e-

commerce are just few examples on how the participating startups have squeezed the dominant business models to adapt to market conditions or to create new business opportunities.

In terms of technological scope, we distinguished three categories of innovators. *Low Tech startups* innovate in established industrial processes such as recycling and construction to tackle some environmental issues. One of the startups obtained patents for its process innovation and benefited from strong ties with a research lab in the university. Digital transformers exploit available information technologies to develop their own digital platforms using a combination of available software modules, inhouse architectures and specific software developments to create differentiation (Henderson & Clark's architectural innovation, 1990), They aim to digitalize and transform different sectors such as health, recruiting, real estate or commerce. Tech innovators have created original technological solutions mainly in the software field. Only one participant has patented few innovations in hardware development and Internet of Things. The three startups from this latest category happen to be also those with a higher level of innovation intensity.

Innovation Depth: The National Level as a Frontier of Innovations?

Most of the startups in the panel (9/13) are innovating locally, they are addressing a local (city-level) or more often the national level. They have introduced concepts existing in other countries but new to the consumer in the Moroccan market (Garcia & Calantone, 2002). They have made adaptations to cater for the local customers and culture. Some other startups have started from scratch to develop original concept thinking they are completely new to the industry, but they discovered afterwards that they have already been implemented elsewhere.

We have also found a couple of startups that are forerunners of new concepts at the level of the African continent. They have gained awards and recognition from international organizations as such. However, those startups are not operating or envisioning to launch their innovations in other African countries. They are mainly focusing on the local market. According to interviews, struggles to manage the innovation locally, to scale and to get funds and support from the ecosystem, might explain, the limitation of innovation to the local and national level.

Only one startup represents an exception. It has targeted the African market from the outset and has deliberately chosen not to operate in the national market where incumbents have strong lobbying power. This startup has also a strong potential and concrete plans to bring its innovation to some Asian countries.

Finally, two startups, have introduced original concepts for the first time to the industry at the global level and have gained recognition as such by international organizations too. They have been, however, followed by others in other markets. Those startups didn't particularly target an international market, but they are aware that their growth would require an international expansion.

DISCUSSION

The conceptual model introduced in the present study contributes to the literature on innovation typology. While most of the existing models are based on a prevailing bi-dimensional typology (Choffray & Dorey, 1983; Gardiner & Rothwell, 1985; Henderson & Clark, 1990), our construct offers a tridimensional conceptualization of innovation adding the new stream of more holistic research (Becheikh et al., 2006; Crossan & Apaydin, 2010; Garcia & Calantone, 2002; Gatignon et al., 2002)

The Innovation Intensity dimension builds on the dominant dichotomy of incremental (or continuous) versus radical innovation (or discontinuous) (Garcia & Calantone, 2002; Schumpeter, 1942; Tidd et al., 2006) and attempts to simplify and reunite the different terminologies and the semantic nuances (Adams et al., 2006). Findings from the panel of startups supports the idea of a continuous scale of intensity rather than two distinct extremes as argued earlier in this paper. It also illustrates the cyclical behavior of “*creative destruction*” (Christensen, 2006; Schumpeter, 1942) and the combination of different levels of innovation intensity during different stages of the lifecycle (Choffray & Dorey, 1983; Francis & Bessant, 2005; Oslo Manual, 2005; Schumpeter, 1942) and the importance of R&D for both incremental and radical innovation.

The innovation scope dimension synthesizes the various categorizations of innovations found in the existing literature (Choffray & Dorey, 1983; Francis & Bessant, 2005; OECD, 2005; Schumpeter, 1942). Findings from the qualitative research supports the existence of a mix of innovations but illustrates the dominance of product innovations in line with their prevalence in the literature. Marketing and commercial innovations that were added to the Oslo manual in its latest versions (OECD, 2005) are also less recognized or cited by the entrepreneurs. Business model innovation is however widely uncovered in this research reflecting the evolving literature on business model innovation. (Chesbrough, 2010; Francis & Bessant, 2005; Teece, 2010).

Innovation Depth offers a high level conceptualization of typologies based on the locus of innovation such as (Fernes-Walch & Romon, 2006; Garcia & Calantone, 2002; Tidd et al., 2006). The micro level (i.e. innovation at the enterprise level) (Garcia & Calantone, 2002) is not relevant for the study of startups’ innovation, since startups are less concerned by internal innovation than by bringing innovation to the market, they are under construction, small and with no or limited internal organizations and processes. The study supported the different other levels of innovation: “*Newness*” to the customer, the market, the industry and to the world (Garcia & Calantone, 2002). But with the wide spread of startups creation globally and the dispersion of information, we found that is it hardly possible to identify precisely the innovation depth or to state clearly, for instance, if the startup innovation is new to the industry or to the world except when it is recognized by international organizations or awarded in international competitions.

CONCLUSION

Through a literature review of innovation typologies and an analytical approach we suggested a classification and clustering of innovation dimensions under three main headings: Innovation Intensity, Innovation Depth and Innovation Scope. The resulting framework provides a synthetic view of the rich and fragmented innovation typology literature. This work is not based on a systematic review, and is not intended to be exhaustive, however, it offers a simplification of a complex body of literature. The framework also provides a methodological tool to identify innovation types for a given enterprise or a given group of enterprises. By providing a triad of open-ended questions this tool is appropriate for qualitative research methods.

We have applied the tridimensional framework to study the innovation typology in a panel of Moroccan startups. The use of the open-ended questions helped detect and classify a variety of innovations types from three different perspectives. The strong interplay between disruptive and incremental innovation, the diversity in terms of innovation Scope with a dominance of product and business model innovation, the national emphasis with limited international impact are the main findings of this exploratory qualitative research.

While there is a lack of research on innovation in Morocco, this work lays down some foundations for the study of innovation at the enterprise level and constitutes the first step for further research to understand Moroccan startup innovation capability. Ultimately this new stream of research in Moroccan startup innovation field will help entrepreneurs and policy makers in their innovation capability building efforts.

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