L'UNIVERSITÉ DE VERSAILLES SAINT-QUENTIN-EN-YVELINES
présente

L'AVIS DE SOUTENANCE

Concernant **Madame Jingshu DU** qui est autorisé à présenter ses travaux en vue de l'obtention de l'Habilitation à Diriger des Recherches à l'Université de Versailles-Saint-Quentin-en-Yvelines en :

SCIENCES DE GESTION ET DU MANAGEMENT

« Collaborative Innovation:
New Technologies, Human(-Machine) Interactions,
and Transcending Boundaries»

THURSDAY SEPT. 18TH À 10:00

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« Collaborative Innovation: New Technologies, Human(-Machine) Interactions, and Transcending Boundaries »

Présenté par : DU Jingshu

Résumé :

Ma recherche s'est centrée sur l'innovation collaborative en R&D, en particulier dans des projets complexes réunissant des partenaires multiples, scientifiques et industriels. J'ai cherché à comprendre les ressorts organisationnels, cognitifs et relationnels qui rendent ces collaborations efficaces et durables. Ainsi, mes premières études ont montré que la manière dont une entreprise formalise ses processus de gestion peut jouer un rôle décisif selon le profil de ses partenaires. Alors que les collaborations avec des partenaires de marché gagnent en efficacité grâce à une gestion structurée, celles menées avec des partenaires académiques s'épanouissent davantage dans un cadre souple et adaptatif. J'ai également souligné l'importance stratégique de la vitesse de transfert technologique, notamment dans la phase de transition des résultats de recherche vers les unités d'affaires. Les partenariats industriels facilitent généralement ce transfert, alors que les collaborations scientifiques ne jouent ce rôle que dans les projets à très forte complexité technologique. Dans un second temps, j'ai élargi l'analyse à une typologie plus riche des partenaires, incluant les partenaires horizontaux, les acteurs de la chaîne de valeur et les prestataires de services technologiques. Mon travail sur les entreprises innovantes chinoises a révélé que la combinaison de capacités internes de R&D avec des apports externes ciblés permet d'optimiser les résultats d'innovation. Certaines synergies – par exemple avec les fournisseurs ou les partenaires horizontaux – renforcent les performances, tandis que d'autres, comme les collaborations universitaires, exigent des conditions particulières pour produire des effets notables. Parallèlement, j'ai porté attention aux acteurs institutionnels de l'écosystème d'innovation, en analysant notamment le rôle des bureaux de transfert de technologie dans la valorisation des inventions universitaires. J'ai constaté qu'ils contribuent avant tout à l'augmentation des brevets détenus par l'université, plus qu'à l'accroissement du volume d'inventions produites.

Une autre dimension essentielle de mes recherches porte sur la temporalité des collaborations. J'ai démontré que, dans les projets multipartites, la réussite dépend autant de la simultanéité que de la séquentialité des engagements. Chaque partenaire doit intervenir au bon moment selon ses compétences et sa place dans la chaîne de valeur du projet. Cette logique de coordination temporelle, que j'ai conceptualisée dans le cadre d'une étude saluée à l'Academy of Management, permet de mieux comprendre pourquoi certaines collaborations échouent malgré des ressources importantes, tandis que d'autres réussissent en mobilisant finement des séquences d'engagement différenciées. Cette approche temporelle m'a permis d'affiner mes réflexions sur la gouvernance des connaissances et sur l'orchestration stratégique des portefeuilles d'innovation.

En parallèle de ces travaux collaboratifs, j'ai affirmé une posture d'autonomie académique à travers des publications en auteur unique. Dans l'un de ces articles, j'ai analysé les interactions entre différents modes d'ouverture des connaissances (sélective, contingente, orchestrée) et les domaines technologiques d'une entreprise. Il en ressort que les collaborations menées dans des domaines non stratégiques mais connexes offrent souvent les meilleures performances. En orchestrant habilement ses partenariats externes, une entreprise peut mutualiser les risques et capitaliser sur des apprentissages croisés. J'ai également ouvert mes travaux à l'innovation en matière de modèles économiques, explorant de nouvelles méthodes qualitatives pour appréhender les mutations du capitalisme innovant.

Au fil du temps, ma réflexion s'est enrichie d'une perspective interculturelle. Avec des collègues chinois et néerlandais, j'ai exploré la dimension relationnelle de l'innovation en contexte chinois, à travers le prisme du Guanxi et des valeurs confucéennes. Cette culture de la relation, fondée sur la confiance réciproque, la bienveillance et la morale sociale, contraste avec les approches occidentales fondées sur le contrat et la propriété intellectuelle. L'histoire des grandes inventions chinoises – de la boussole à l'imprimerie – témoigne d'une logique d'ouverture et de circulation des savoirs qui continue d'influencer les modes d'innovation contemporains.

Aujourd'hui, mes travaux se projettent vers plusieurs axes de recherche. Le premier concerne la prise de décision dans des environnements incertains. L'innovation ne répond pas à une rationalité linéaire, et il est fréquent que de bonnes idées échouent faute de ressources, tandis que des solutions médiocres prospèrent grâce à des arbitrages favorables. Je souhaite donc explorer les biais cognitifs, les expériences managériales et les logiques d'allocation des ressources dans la gestion des projets d'innovation. Le second axe porte sur les incitations des dirigeants. Comment encourager une innovation socialement responsable ? En étudiant la nature des incitations – monétaires et non monétaires – selon les rôles et niveaux hiérarchiques, j'espère mieux comprendre les déterminants des stratégies d'innovation durablement orientées.

Le troisième axe de mes recherches à venir porte sur les écosystèmes d'innovation durable. En collaboration avec Finance Innovation et Mines ParisTech, j'étudie l'impact des dispositifs de soutien sur la réussite des levées de fonds de startups Greentech. Les premiers résultats montrent que ces effets varient selon le profil des fondateurs, notamment en défaveur des fondatrices. Enfin, je souhaite approfondir la question de l'innovation sous contrainte, à travers le concept de bricolage. Faire plus avec moins, mobiliser les ressources existantes, articuler motivation et capacité d'agir: autant de dimensions qui méritent une attention renforcée.

Une dernière question traverse en profondeur l'ensemble de mes travaux : celle des frontières. Où commence la collaboration ? Où finit-elle ? Comment distinguer le « nous » du « eux » dans un monde d'interactions mouvantes ? J'ai commencé à élaborer une typologie conceptuelle des frontières organisationnelles – limites poreuses, recouvrantes, transcendantes ou dissoutes – pour comprendre les mécanismes qui régissent le passage d'un statut à l'autre : collaboration, compétition, ou coopétition. Cette réflexion sur les frontières, amorcée à la Copenhagen Business School, m'ouvre de nouvelles perspectives théoriques et appliquées, que je développerai plus en détail dans la partie suivante de mon mémoire.

Abstract:

Collaboration and *Innovation* has been the guiding theme of my research and teaching over the years. Innovation is an eternal topic, and it cannot be achieved – perhaps even more so today than ever before – without collaboration. "Most innovations fail, but companies that do not innovate, die". So wrote Prof. Henry Chesbrough – the "Father of Open Innovation" and member of my doctoral committee – in the introduction of his first book[1] published in 2003.

In achieving (especially radical, breakthrough) innovations, lone inventors are more often a myth than reality. Research shows that lone inventors are less likely to achieve breakthroughs and more likely to get particularly poor results (Singh & Fleming, 2010)[2]. Further, it is found that innovations resulting from the recombination of *more knowledge domains*, especially those that *usually might have not been connected before*, can be more radical in nature (Schoenmakers & Duysters, 2010)[3]. Relatedly, it is emphasized repeatedly that "No business is an island" (Håkansson & Snehota, 1989)[4] and "No firm is an island" (Madsen & Desai, 2018)[5], which is surfaced to be particularly true and relevant in the world today where we all have to collaborate and unite to fight against perplexing problems and solve so many grand challenges – regardless of our gender, wealth, race, ethnicity or religion.

In the existing literature, multiple definitions about collaboration and innovation (or, hereafter: collaborative innovation) can be found. In my research, I focus primarily on collaborative innovation in research and development (R&D) – in other words, R&D collaborations – with multiple, diverse types of partners – in particular, science-based partners and market-based partners, at the level of R&D projects. R&D collaboration is a very complex process, and especially so when multiple partners are brought onboard. Being open and collaborative in innovation is not just an easy saying, not just

[1] Chesbrough, H. W. (2003). Open innovation: The new imperative for creating and profiting from technology. *Harvard Business School.*
[2] Singh, J., & Fleming, L. (2010). Lone inventors as sources of breakthroughs: Myth or reality? *Management Science*, *56*(1), 41-56.
[3] Schoenmakers, W., & Duysters, G. (2010). The technological origins of radical inventions. *Research Policy*, 39(8), 1051-1059.
[4] Håkansson, H., & Snehota, I. (1989). No business is an island: The network concept of business strategy. *Scandinavian Journal of Management*, 5(3), 187-200.
[5] Madsen, P. M., & Desai, V. (2018). No firm is an island: The role of population-level actors in organizational learning from failure. *Organization Science*, *29*(4), 739-753.

"talk the talk", but "walk the walk". When engaging in collaborative innovation, there are a number of factors to consider. For example, the partners can be very diverse and from different parts of the value chain (e.g., science-based partners, or upstream partners such as universities and research institutions, and market-based partners, or downstream partners such as suppliers and customers), different countries (and cultures), and different levels of technological importance to the firm (e.g., core, adjacent core, or non-core technologies). Further, the way how companies organize their activities could be distinct and idiosyncratic, which is oftentimes labelled as "business models" and deserve a better understanding. Finally, the interplay between technologies and the ways how to manage these technologies – generally speaking, how to organize for innovation, can be super intriguing and highly relevant to business practices.

My efforts examining the above-mentioned intriguing issues have resulted in a number of (some "highly cited") papers. To deepen the understanding of collaborative innovation and innovation performance, I used a range of different output measures, such as financial performance, innovation speed, patent counts, and patent quality. I found that market-based partnerships are positively correlated with project performance if a formal project management process is implemented; however, these partnerships are associated with lower performance levels for loosely managed projects. In contrast, science-based partnerships are associated with higher project revenues for loosely managed projects only. In another paper, I found that a fast transfer speed (as measured by the time it takes for a R&D project to develop and transfer its first research result to business units) is associated with a better research performance (as measured by the total number of transfers the research project generates). Moreover, different types of R&D partners — science-based and market-based partners — play distinct roles in speeding up project first research transfers. While market-based partnerships (i.e., customers and suppliers) generally contribute to a faster transfer of first research results, science-based partnerships (i.e., universities and research institutions) only speed up first research transfers of technologically very complex projects. As partners may be very diverse, and firms may also differ in their own innovation capabilities (e.g., absorptive capacity). In a third paper, I further expanded my focus from two partner types (market-based or science-based) to four groups of partners – science-based partners; horizontal connections; value chain partners; and technology service providers and

study the interaction between internal R&D and different types of external knowledge sourcing in the context of Chinese innovative firms. The findings suggest that the mixture of different types of external knowledge partners in combination with internal R&D capabilities is crucial in understanding the role of open innovation in emerging economies. More specifically, both internal R&D activities and external knowledge sourcing have a positive effect on firms' innovation performance. Strong internal R&D capabilities also increase the effect of sourcing from value chain partners and horizontal connections, but there is no evidence for complementarity between internal R&D and collaborations with universities and research labs.

Later, my interests spanned to not just the innovator (e.g., the innovative company or its R&D projects) per se, but also the role played by the supporting actors (or the institutional players) in its surrounding ecosystem. For example, collecting data from one of the largest Dutch research universities during the period 2000–2009, and further building on first-hand qualitative and quantitative materials, in one paper, I studied the role of university Technology Transfer Offices (TTOs) on innovation and found that TTOs are instrumental in generating more academic patents. However, this effect is predominantly manifested by the increase in the number of patents patented under the name (solely or jointly) of the university (university-owned patents), far more than the increase in the absolute volume of patents invented by the university (university-invented patents). When further exploring the mechanisms of organizing for collaborative innovation, I found that the time dimension – the *temporal dynamics* – plays a crucial role in collaborative innovation success. I developed and tested theory on the optimal temporal coordination of partner engagement in multi-partner collaborations. I argue that effective coordination in multi-partner collaboration not only requires simultaneous involvement of all partners at the same time, but also episodes of sequential collaboration with individual partners at different points of time. I further posited that the emphasis on simultaneous involvement over sequential collaboration is project specific and depends on the complexity of technology being developed and managerial resource constraints. I found support for these conjectures in an analysis of over 1000 R&D projects in collaborations with different partner types (science-based partners such as universities and research institutes, versus market-based partners such as suppliers and customers) of a major R&D intensive European electronics firm, with annual R&D investment of more than 1 billion euro.

During this period of time, I started to also write some sole-authored papers. In one paper, I introduced and empirically analyzed the interplay between three knowledge governance mechanisms (*selective*, *contingent*, and *orchestrated* openness) and the different technological fields of the firm (*core*, *related non-core*, and *distant non-core* technologies). Based on a unique first-hand large-scale project-level dataset from a Global 100 firm across a 10-year span, I found that R&D collaborations selectively conducted in firm's related non-core technological fields promise the best innovation performance. Further, by orchestrating its projects across core and non-core technological fields in the same knowledge portfolio, the firm can leverage a network of inter-connected projects when collaborating with external partners. As such, the firm can strategically "distribute" collaboration risks across multiple projects, while optimize its access to external knowledge that it intends to develop. Maintaining my main focus on technological innovations, I also started to explore other types of innovations – namely, business model innovation, and other research methods – namely, qualitative research methods, which has resulted in another sole-authored paper, on business model innovation.

One key element that has been under-examined in innovation studies, and especially relevant in open and collaborative innovation, is the culture and geographical dimension (or origin) of partners. The existing research has (still) been predominantly adopting a Western-centric view, neglecting the subtle (and sometimes great) differences across (international) partners. Especially when collaborating across borders, it oftentimes – and perhaps very regularly — involves underlying cultural factors. In one chapter, I co-authored with colleague Li Yuan (Renmin University of China, Beijing) and Sylvia van de Bunt (Vrije Universiteit Amsterdam, The Netherlands), we examined and highlighted the Chinese traditional core values and explained in detail the concept of "Guanxi" (关系) – a reciprocal obligation and mutual trust and assurance, and its related concepts such as "Ren-qing" (人情), "Bao-en" (报恩), "Mian-zi" (面子), and the "Wu-chang" (五常) – benevolence (仁), justice (义), etiquette (礼), wisdom (智) and credibility and trustworthiness (信) which are the delicate fibers that are deeply woven into the Chinese individual's social, political and business life (Li, Du & vd Bunt, 2016, *Springer*). Compared to the West, the Chinese society has long been guided by the Confucius ("Kong-zi", 孔子) philosophy, the rule of "virtue" rather than the rule

of “law”, and people are expected to behave according to high moral standards and bided by their own morality. Also, it has a long history and culture of being open and free to share knowledge, rather than imposing strict and tight copyright protection. Consider its Four Great Inventions: the compass (指南针, zhǐ nán zhēn), gunpowder (火药, huǒ yào), paper making (造纸术, zào zhǐ shù), and printing technology (活字印刷术, huó zì yìn shuā shù). These great inventions by the Chinese people have made vital contributions to the civilization in the human history and have been widely used throughout the world, and the users were/are never charged even a single penny. Other vital inventions such as silk, tea, porcelain, Chinese herbal medicine, acupuncture, mechanical clock, iron smelting, bronze, rocket, umbrella, earthquake detector, and even the toothbrush, alcohol, and Bonsai – some dated back even 9000 years ago. These differences treating and disseminating innovations, translate into interesting contrasts, especially in the field of innovation and collaboration.

Considering the future, while I did a number of in-depth studies to better understand collaboration and innovation, there remain several important aspects that call for further exploration. For example, from my research, I find that apart from technology excellence, the human factor is perhaps equally – if not more – important for the success or failure of innovations. As innovation is such a highly risky and highly uncertain process, it is hard (or less easy) to attribute direct reasons for failure when it fails. Therefore, a lousy technology equipped with great and abundance resources may still reach the market, even though it may not be rationally the best choice. On the contrary, a great technology with ill-equipped resources (or even deprived of resources), may be killed early in the process, despite its technological potential. These Type I error (“false-positives”) or Type II error (“false-negatives”) may occur frequently in innovation management, exactly because of the uncertain nature of innovation. In one of my future research projects, I plan to understand strategic decision making in such a highly uncertain and risky innovation environment. Particularly, I plan to study the career experience of managers, their biases and heuristics, and the resource allocation in innovation projects, and how do those translate into the success or failure of innovation projects.

A second line of my future research relates to the incentives and motivation of innovation managers. Innovations are great, but they are like a double-edged sword which could also be harmful if developed into the wrong direction. How to successfully and effectively incentivize the main decision makers – the innovation managers – to embark on a journey that is beneficial to the society, beyond just the financial considerations, is another aspect that I'm interested in exploring. Adopting an "open innovation" perspective that "not every smart person is working for you", and considering there is a high turnover among top executives across companies, in my future study, I plan to focus on the inter-organizational comparison among executives' pay differences. As there are important nuances in executive incentives, including both monetary pay (e.g., salary and cash compensation) and non-monetary pay (e.g., stock options), and executives are situated at different ranks (e.g., CEO and non-CEOs), I further differentiate between executive monetary pay (compensation incentives) and non-monetary pay (e.g., equity incentives) and see how these incentives motivate managers to undertake different innovation strategies. In the follow-up studies, more aspects rather than executive pay could be explored.

A third line of my future research concerns the ecosystem surrounding the innovation, especially the sustainable, green innovations. In one on-going research that I conduct with colleagues at Finance Innovation and Mines-Télécom Paris, we study how do different types of facilities and supports in the ecosystem affect fundraising success of Greentech startups. Employing a unique first-hand database on the fundraising activities and results of 1610 SMEs in Greentech, and further linking the fundraising database to the founders' profile database, we test the contingency effect of ecosystem support on founder characteristics. The initial results suggest that not every support is created equal as large contingencies between ecosystem support and founders' characteristics are at play. Also, the results reveal that there is still a long, long way to go for female founders in their funding activities, as they seem to face multiple barriers in their funding activities.

A fourth line of my future research is about the approaches and the means to innovate. Not every company or country has the same endowment, resources, or development stage when it comes to innovation. Therefore, being creative to "do more with less"[6] deserves a more thorough understanding. Exploring the enabling factors of innovation – both in the firm and in the ecosystem – I plan to focus on bricolage – making do with existing resources at hand. Proposing bricolage as a vital capability for innovation, differentiating firms' motivation into intrinsic motivation and extrinsic motivation (e.g., normative pressure), and categorizing firms' bricolage activities into internal bricolage (exploiting internal resources and expertise) and external bricolage (leveraging external resources and expertise), I plan to explore the importance of both willingness and capability to innovate, and the interaction between willingness and capability in achieving satisfactory innovation performance under resource constraints.

Next, and perhaps a very philosophical question when talking about collaboration and innovation, is fundamentally where and how do we draw the line to demarcate the organizational boundaries? In other words, where/when is "I" or "we", and where/when is "you" or "them"? In my view, boundaries are always changing, giving rise to various dynamic interaction modes among partners. In this line of research, I plan to take a complete conceptual approach and explore the boundary-setting condition, criteria, and mechanism that demarcate two dichotomous states of potential collaborators – as being "in" or "out" of a group – which, in turn, results in three unique statuses: collaboration, competition, and co-opetition. I delineate four types of changing boundaries: *spanning boundary*, *porous boundary*, *transcending boundary*, and *dissolving boundary*, with the aim to find the boundary setting mechanisms in different scenarios. Next, I plan to understand the boundary crossing behavior of individuals and groups, and the difficulties and challenges faced by them – which I labelled as categorical boundaries and symbolic boundaries.

[6] Again, I'm very inspired (and proud) by the very creative approach that DeepSeek takes when it comes to facing constraints in innovation.