

Opening the Fuzzy Front End: A Synthesis of Two Theories

Antero Kutvonen, Marko T. Torkkeli

¹Lappeenranta University of Technology, Kouvola research unit, Kouvola, Finland

Abstract--Companies must innovate, today and tomorrow. The ability to provide new products and solutions to the markets is critical for maintaining a continuous revenue stream, especially in this age of fundamental changes. Product development processes have been studied since 80s and nearing 90s academic attention turned to early phases of development, i.e. fuzzy front-end. Activities at the fuzzy front end of product development process are often chaotic and experimental with rather unpredictable or uncertain commercialization future. Opportunities are raising, but a firm still cannot do all needed development actions in-house. The theory of open innovation has tackled some of emerged dilemmas. It proposes that one should open knowledge and technology borders of the company for idea exchange, because there might be better business model for the technology that apparently is not valuable for you.

In our paper OI and FFE theories are merged to introduce a framework for parallel business plan and technology development, leading to new discoveries in the relation between FFE and external technology exploitation. The framework is evaluated by how it can help organizations to improve their product development profitability by coping with in- and outflows of technology.

I. INTRODUCTION AND BACKGROUND

Companies must innovate, today and tomorrow: a constant stream of new applications, models, products and / or services is of paramount importance to maintaining a competitive advantage. Approaching the end of the twentieth century however, innovative firms felt the pressure of escalating costs of developing new products and shortening product lifecycles that resulted in diminishing returns from development efforts. The New Product Development (NPD) process has been studied since the 80's [46, 12] and in the late 80's and early nineties early phases of product development, i.e. fuzzy front-end (FFE), became popular among academics [33]. It was soon established that activities at the fuzzy front-end of the product development process are often chaotic and experimental, with rather unpredictable or uncertain commercialization future [35]. Even if the process of internal FFE is studied thoroughly, an abundance of opportunities lays outside of the organizational boundaries. Open innovation (OI) theory proposes that one should open knowledge and technology borders of the company for idea exchange, both in- and outbound, because there might be a business model for the seemingly useless technology you are holding; or even someone holding a technology that you have been seeking to develop all along [5]. In both theories there are implicit connections to each other and, while the research on external acquisition of knowledge does discuss boosting your front-end efforts by external inputs (e.g. via the popular case of P&G [31]), hardly any literature goes further in addressing the connections between the two theories. This is

surprising, since before the emergence of Open innovation, FFE was seen as the area where decisive performance improvements to new product (or innovation) processes could be made, whereas now the most potential and buzz is centered on Open innovation practices.

In this paper we introduce a framework for fully integrating the open innovation paradigm with the fuzzy front end of product development process. We review both theory of FFE and OI, analyzing mutual and overlapping ideas of the theories. Then we merge the theories into a framework, which would help a company to manage their innovation powered product development process. The framework is thus evaluated by how it can help companies to improve their product development profitability by coping with in- and outflows of technology. In summary, the primary objectives of this paper are to investigate the applicability of the open innovation theories to the fuzzy front end of NPD, to provide a framework for strategic, proactive managing of in- and outflows of knowledge and further the contemporary understanding of FFE and OI theories. The focus here restricts us to the early phase of new product development and the managerial actions taking place there (as opposed to also addressing the more formal stages of the NPD process). There is a decisive emphasis on the inside-out side of open innovation, i.e. the external exploitation of knowledge, as the outside-in, or external acquisition, is already more widely covered in the existing literature. Other limitations include a focus on the commercial firm, neglecting the cases universities and other research institutes engaged in innovative activities. The search for literature was focused on quality journals as well as some books, e.g. on open innovation, in order to provide for high-quality inputs. Keywords for scanning the literature were among others, fuzzy front end, open innovation, external technology exploitation, new product development and licensing.

The paper is arranged as follows. After the introductory section, we discuss about the Open Innovation Perspective with main arguments on why and how it is relevant for modern companies. Then, the following section gives us a look into the Fuzzy Front-End of Product Development Process, where the literature on its benefits and challenges for an organization are reviewed. After this the paper moves on to a synthesis of the two theories in the fourth section, where we develop a framework for Open Innovation applicability in the Fuzzy Front-End of Product Development Process to capture what we consider the primary implications of open innovation for managing the fuzzy front end. Finally we conclude our study in the fifth and final section with a summary and some suggestions for promising avenues of future research.

II. AN OPEN INNOVATION PERSPECTIVE

The innovation models have been changing during the past decades, advancing through five distinct generations towards a more complex and connected picture. [47] But still for the most part of the twentieth century, even though companies realized the importance of flexibility and networking in R&D-operations, they kept their processes as a highly protected, secret business that was carried out all the way from beginning to end inside the company. Tidd et al. [49] use the expression “the development funnel” to describe the transformation of an idea to a product or a service. Innovations move through different stages from the idea creation to the launch phase. Later the funnel approach was connected to Cooper’s Stage-Gate System [13]. Here, R&D projects can only enter in and exit one way [7]. Companies believe that they have to do everything internally and a “Not Invented Here” (NIH) syndrome dominates the industrial R&D thinking. If a company had not developed the technology itself, how could it be sure that the technology is qualitative, operative and useful for it? [5] In the other side of the pipeline, people think that if the developed technology is not sold by us, why should we let anyone else sell it either. This phenomenon is known as “Not Sold Here” (NSH) virus. [3] Chesbrough refers to this traditional, and in many cases now outdated, model as the closed innovation model [5].

The closed innovation approach worked well in the environment of the twentieth century and it led many companies to success. Even in this day, model goes well with some industries, like nuclear power and war industries where control is in a critical position. [25] But changes in the knowledge landscape force the industrial R&D to develop new models for the innovation process. Chesbrough [5] names four erosion factors that have caused problems to the closed innovation model. The first factor is the increasing availability and mobility of skilled workers. The number of highly educated and trained people has grown significantly after the Second World War, and an increased labor market gives well-trained workers an opportunity to shift from one company to another. If an employee is talented enough he or she might start a company of her or his own with the help of a venture capitalist. The rise of the venture capital market is the second erosion factor. These two factors mentioned lead to the third: external options for ideas sitting on the shelf. The customers and the competition will not patiently wait for those ideas to be established as technologies. If a company does not launch the technology, someone else will. The last erosion factor identified is the increasing capability of external suppliers. A successful company can trust its suppliers instead of doing everything on its own. Academics and business people picked up on these events and a string of literature emerged, heralding a fundamental change in the innovation paradigm.

A decade ago von Hippel [30] suggested that companies should use external sources, customers, suppliers, universities and other companies, in their R&D activities. At the same

time, Cohen & Levinthal [11] empirically proved that firms have to learn from the environment. For doing that, R&D resources need to be allocated to developing and sustaining absorptive capacity as well. The importance of alliances and networks has been another popular topic of study in the 90s (see e.g. [28]). Prior research has largely focused on external knowledge acquisition and the make-or-buy decision, i.e., whether to develop knowledge in-house or to acquire it from external sources (see e.g. [27, 54, 24]). Since the 1990s scholars extensively studied various governance modes for external technology sourcing like strategic alliances, joint ventures, acquisitions (see e.g. [37, 29, 53]), or inward technology licensing [49]. Recently, moreover, other governance modes, such as the use of corporate VC investments to leverage external R&D, have been considered as well (see e.g. [55]). The perspective of actively managing the external exploitation of knowledge assets has been adopted in literature as well. The first studies in the 1970s – mainly in the field of technology management – primarily considered specific aspects, such as international licensing agreements. The term ‘technology marketing’ was also coined then by David Ford. After these early works there has not been a continuous research stream on this topic, however. The relevant literature is also highly fragmented: subtopics of the technology marketing include e.g. technology licensing, technology-based spin-offs, strategic alliances and joint ventures [23].

Henry Chesbrough [5, 8] brought together these emerging ideas, fundamentally different from the previous conceptions of how innovation works, in his theoretic model of Open Innovation. It builds on the basic assumption that the knowledge landscape has changed, announcing the business model instead of technology development prowess as the key success factor for an innovative business. The basic premise of the open innovation model is that by enlarging your “research organization” you may be able to tap into a much larger pool of ideas and find such ideas faster than if you limit yourself to the traditional, closed innovation model. Furthermore, you may benefit from “dead born” ideas by utilizing them outside the boundaries of your own firm, but within the business models of other firms, where these ideas may unfold their full potential. In table 1, the basic principles of both closed and open innovation models are listed to highlight the difference between these two models.

The intellectual property (IP) governed by a company, and previously considered primarily a defensive asset for raising competitive barriers and cementing the firm’s position in the market, is now seen as growingly as a resource or commodity exploited much more diversely. As Chesbrough [7] sums up, open innovation is both a set of practices for profiting from innovation, and also a cognitive model for creating, interpreting and researching these practices. It offers guideline to perceive the prevailing innovation landscape. But even if openness in the innovation process is highly encouraged there will always be need for some closeness, too [10, 34].

TABLE 1. CONTRASTING THE PRINCIPLES OF CLOSED AND OPEN INNOVATION. [4]

Closed Innovation Principles:	Open Innovation Principles:
The smart people in our field work for us.	Not all of the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from other's use of our IP, and we should buy other's IP whenever it advances our own business model.

Although much of the practice and literature of open innovation is revolving around the acquisition of knowledge assets, assuming that knowledge is widely spread, abundant and that even the successful innovators with big R&D resources have to look for the external sources of innovation [8], the interest in external knowledge exploitation (in terms of “selling” or exchanging knowledge in the market) has also grown significantly (see e.g. [6, 8, 51]). A primary reason for this increased attention to the “sell” side comes from the fact that markets for technological knowledge have developed and firms have more opportunities to leverage their technological assets [1]. Various ways of externally exploiting knowledge include, but not limit to, selling of technologies and intellectual property (IP) like patents, licensing-out, and collaborations in order to gain extra revenues. It may further be used to realize strategic benefits, such as establishing own technologies as industry standards [26, 40]. However, since selling of knowledge assets also has negative effects (in particular, the diffusion of competitively relevant knowledge), firms are increasingly faced with a “keep-or-sell” decision [41].

Even if there is a lot of discussion and literature in the recent years about Open innovation, the exact definition of the concept may not be entirely obvious. Chesbrough [5] defines Open innovation by the movement of knowledge across the boundaries of the firm (or organization). This definition can be considered somewhat inconclusive; for instance, no innovation is created ‘in a vacuum’ so an influence of knowledge or information external to the organization is always present and even companies with tight IP protection usually will ultimately ‘leak’ knowledge outside. When dealing in an interorganizational setting, we propose that Open innovation could be more explicitly defined as follows:

Open innovation describes an organization’s deliberate commercializing (exploitation) of knowledge assets to and / or acquisition from another independent organization involving a contractual obligation for compensation in monetary or non-monetary terms.

It should be noted, however that even this definition does not capture all instances of the paradigm of Open innovation, such as the donation of intellectual property to the Open source movement in the software industry by e.g. IBM [9].

III. FUZZY FRONT END OF TECHNOLOGY DEVELOPMENT

“Everything is vague to a degree you do not realize until you have tried to make it precise.”

- Bertrand Russell

The fuzzy front end, a term first popularized by Reinertsen and Smith [48], is considered to be the earliest stage of the NPD process and roughly is meant to denote all time and activity spent on an idea prior to the first official group meeting to discuss it, or what they call “the start date of team alignment.” Other ways of thinking about this concept is understanding the fuzzy front end as the territory leading up to organizational-level absorption of the innovation process [11], or refer to the efforts that precede a formally structured new product or process development (NPPD), Stage-Gate™ or Product and Cycle Time Excellence (PACE®) –process [35]. There have also been attempts where the Fuzzy Front End has been depicted as an extension of the formal Stage-Gate process as the “pre-phase zero, phase zero and phase one” phases by some authors [16, 33, 43]. Exact definitions vary, but in generalized terms the Fuzzy Front End (or synonymously Front End of Innovation, or FEI [35]) can be defined as follows:

Fuzzy front end refers to the early “ideation step” [14] that precedes a structured NPD process and is concentrated on generation, refinement and analysis of new concepts [35] arising from identification of a unfulfilled market need and / or a (untried) technological opportunity [48] and ending in organizational commitment to advance and fund the concept to NPD or discontinue concept development [33].

The “fuzziness” of the front end refers to the high degrees of technical and commercial uncertainty related with the concepts and ideas processed at that early phase, which also are a lead cause of the managerial difficulties associated with it. The primary interest in the area is motivated, aside from its unique nature in the innovation process, also by its immense effect on the success rate of new product and process development or as Zhang & Doll [56] put it: most projects do not fail in the end, they fail at the beginning. Based on prior works on the fuzzy front end and the nature of uncertainty, Zhang & Doll [56] define the front-end fuzziness of NPD as the uncertainty of customers (portfolio, preference, life-cycle and volume fuzziness), technology (material, specification and supply fuzziness) and competition (competing product development and adoption speed fuzziness). According to Smith and Reinertsen [48], of all the actions firms can take to

improve their NPD process, those taken at the fuzzy front end give the greatest time savings for the least expense. Managers and researchers alike claim that the benefits resulting from improvements in the front end are likely to far exceed those that result from improvements aimed directly at the design engineering process [2, 18, 46]. This is related to the relatively low cost of generating several potential ideas compared to the cost of actually implementing any one idea [52]. Several studies have indeed provided evidence of a link between new product performance and time spent on up-front activities [19, 36, 52].

Scholars of NPD have discussed “up-front activities” in a generic way for more than 20 years [20]. Especially in the nineties, there has been a notable string of literature [32, 43, 45] pertaining to this subject, most of it having to do with managing the uncertainties, speeding up the screening of ideas or attempting to provide structure into the seemingly chaotic, experimental and unpredictable phase of the innovation process [35]. Khurana and Rosenthal [32], Moenaert et al. [43], and Reinertsen [45] have contributed to a better understanding of the FFE by examining key fuzzy front-end issues and their particular impact on product innovation success. Specifically, Khurana and Rosenthal [32] focused on the importance of structured strategy for dealing with new product opportunities at the fuzzy front end; Moenaert et al. [43] examined the importance of communication at the research and development (R&D) – marketing interface for ensuring better concept development at the fuzzy front end; and Reinertsen [45] investigated the importance of optimizing the fuzzy front-end process by speeding up decision-making and screening. Eldred & Mcgrath [22] also described a process (Technology Realization and Commercialization, or TRAC) suitable for managing technical uncertainties in the FFE, but restricting to a technology development scenario. More recent research includes the attempt to reduce and explain the fuzziness of the front end by applying uncertainty theory [56] as well as Reid & Brentani’s [44] distinction between the fuzzy front ends of radical and incremental innovation.

Reid & Brentani [44] state that it is possible to distinguish early and late activities comprising the fuzzy front end, regardless of level of innovation (incremental or discontinuous), whereas Koen et al. [35] describe the fuzzy front end as a set of five non-sequential elements with no preset order of execution. The early activities, according to Reid & Brentani [44] are, problem/opportunity structuring and/or identification/recognition [38, 52]; information collection/exploration [42]; and “up-front homework” [15], whereas the later activities are seen as involving aspects of idea generation and concept development [13, 52], continued information collection, and informal or prescreening [20, 21] with possibly some initial fund allocation for exploring a new idea [13, 17].

The fuzzy front end model that we will be confirming to in this paper is the New Concept Development (NCD) model introduced in 2001 by Koen et al. [35]. The model consists of

three key parts: (1) The five key elements (activities) in the fuzzy front end, namely Idea genesis, Idea selection, Opportunity identification, Opportunity analysis and Concept & Technology Development; (2) The engine which drives the above-mentioned elements and is fueled by the leadership and culture of the organization; and (3) The influencing factors, consisting of Organizational capabilities, Business strategy, the Outside world (i.e. distribution channels, customers and competitors) and the Enabling science [34].

IV. SYNTHESIS OF THE TWO THEORIES AND THE RESULTING NEW FRAMEWORK

Both the theories of Open innovation and Fuzzy front end deal with issues central to success in innovation management and new product or technology development. Indeed, both have even been seen as the most promising avenues of research for boosting innovation success in their own time. These two theoretical models are however situated somewhat differently in respect to the entire innovation process of the organization. In the literature of the fuzzy front end, it is often portrayed as one of three segments in a sequential process that depicts the innovation activities undertaken by the firm: Fuzzy front end, New product development (e.g. Stage-Gate™) process, and finally Commercialization. In contrast the Open Innovation model is often illustrated in connection with the “development funnel” (depicting the new product development pipeline in the firm), as in Figure 1 below.

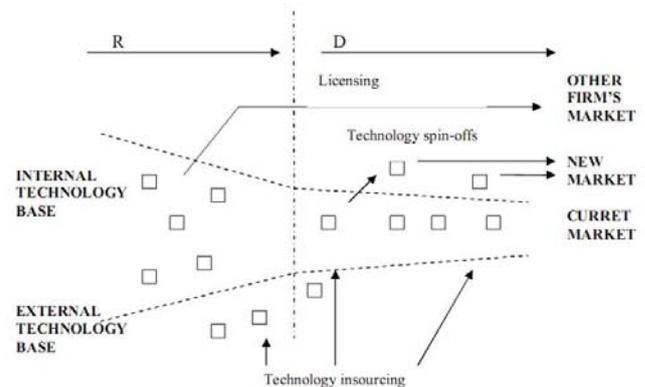


Figure 1. The open innovation model [8]. The dotted lines represent the firm boundaries in the “development funnel”, where the small squares represent product concepts.

The fuzzy front end is situated at the leftmost side of the development funnel, so the foremost overlap of the two theories is to be found in acquiring external knowledge (i.e. tapping into the external technology base). Here, open innovation leverages the role of R&D. The researchers’ job is transformed from only creating knowledge to also capturing it from outside the company. It comes as no surprise that this kind of application of the Open innovation viewpoint to the activities of the fuzzy front end is indeed implicitly discussed in various FFE studies [e.g. 35] and, to

exacerbate, any use of e.g. Lead user methods [30] can be considered conforming to the OI ideology. However, even here it is worthwhile to notice that even though the use of external knowledge is highly beneficial and crucial to the success rate of activities in FFE, the wide majority of the studies in that field still have a decidedly internal focus. A higher rate of interaction with the external environment can be applied both in opportunity identification (e.g. Lead user methods) and idea generation (e.g. brainstorming together with trusted suppliers or investigating in-licensing options to fill technology gaps). Companies that have reached an even higher, sustained level of openness in their business model may be able to benefit from the external possibilities in opportunity and idea analysis elements of FFE as well, even partnering with competing firms in concept development entirely, when it makes business sense for both participants. A good example of a company mastering these principles is found in Procter & Gamble [31] and their Connect and Develop –approach.

The external exploitation of knowledge, on the other hand, seems an entirely uncovered topic in the fuzzy front end literature. This was expected as well, as this ‘inside-out process’ of Open innovation [26] is generally perceived as being more challenging for companies. Firms, excluding few Open innovation exemplars such as IBM and P&G, are still finding it difficult to overcome both the inadequacies of the current technology marketplace and the “Not Sold Here” virus rampant in their organizations. Furthermore, the conceptual arrangement of the innovation process, where commercialization and FFE are separated by the formal new product development process, found in much of the fuzzy front end literature also points towards difficulty in making the connection between FFE and external commercialization of knowledge.

Does such a connection exist then? When assessing the potential of a new innovation, measurement errors in the fuzzy front end and its interface to NPD, *false positives* and *false negatives*, are paid attention in the open innovation model. Chesbrough especially [6] refers to the false negatives, which are projects that companies abandon, because they seem to be unpromising and unsuitable to the firm’s business model, although they hold tacit, inherent potential. To manage these measurement errors in conditions of high technology and market uncertainty, he proposes that companies adopt a new way to manage innovation, one that explicitly deals with the research waste generated by inevitable measurement errors.

We found that connecting the less explored external exploitation side [39] of open innovation with the theoretical basis of the fuzzy front end leads to some interesting findings. While many of the prevalent pieces of literature regarding methods of increasing firm performance in the front end focus on ways to achieve faster kill decisions for ideas and opt for aggressive screening, applying the open innovation perspective would in some cases seem to provide additional justification for keeping ideas in further

development and at the least provide alternate ways to deal with some of the ideas that face the kill decision and would otherwise be filed on the shelf as “dormant” concepts, only never to be looked at again. Integrating practices from open innovation, previously associated only with the actual new product development phase of the innovation process, we managed to enhance the new concept development model, creating a new framework for managing activities in the fuzzy front end that is better suited to a firm that is embracing open innovation principles.

Firstly, we propose that *adopting an open innovation viewpoint in the fuzzy front end reduces unprofitable Kill decisions*. Most of the decisions taken in the fuzzy front end are performed under extremely limited information bases due to the inherent fuzziness [56]. In these circumstances, uncertainty about the future commercial prowess of a concept and its fit to the company’s established business model and product line are critical points that often cause good project concepts to be killed, because scarce resources have to be administered to the projects that bring the most certain profits. These harsh criteria may be alleviated by already in the front end phase of development considering the possibility of complementary or entirely external commercialization of the resulting product or technology. Furthermore, this may even lead to a fundamental change in the way a company operates: if it possesses a solid development capability to produce technologies sought after by the external actors, it stands a chance to reap great rewards by incorporating external exploitation aspects into its FFE concept evaluation criteria. The often neglected option of externalizing a certain concept in mid-development if internal development becomes unattractive lowers the risk involved in undertaking projects and in other cases, the possibility of complementing commercialization by own distribution channels by external non-competitive commercialization, heightens the profit expectations of the concept.

Secondly, being mindful of the opportunities in the external landscape *help reduce concept waste and improve NCD cost effectiveness by introducing a practice of external concept exploitation*. This is illustrated in Figure 2. below. The figure also shows the external knowledge acquisition side of applying open innovation by the arrows denoting the primary elements influenced in the FFE. In the common new concept development model the concepts have but two exits from the circle: continuing towards internal development, or being killed, leading them to be discarded as waste or stored as dormant concepts for an indefinite amount of time. Neither of the kill options salvages any of the resources put into development of the concept, which is frustrating for the company. If we extend the open innovation ideology to the new concept development model, some of the concepts may be salvaged through external concept exploitation even if they are not suitable for internal development. External concept exploitation may manifest in many ways, e.g. partnering with another organization where the company would offer the developed concept and gain access to the

partner's development skills and / or commercialization channels, which ever being the restricting resource for continuing with internal development. Another possible way would be to let the employee(s) "championing" the concept receive capital from a dedicated venture fund to find a working business model for it: if this succeeds the start-up

may be spinned back in. This does not mean that all ideas will be salvaged: mediocre ideas will remain mediocre and still be killed as before. This only means that those novel, profitable ideas that you can't take full advantage of by yourself shouldn't go to waste, or walk out with the employees developing them.

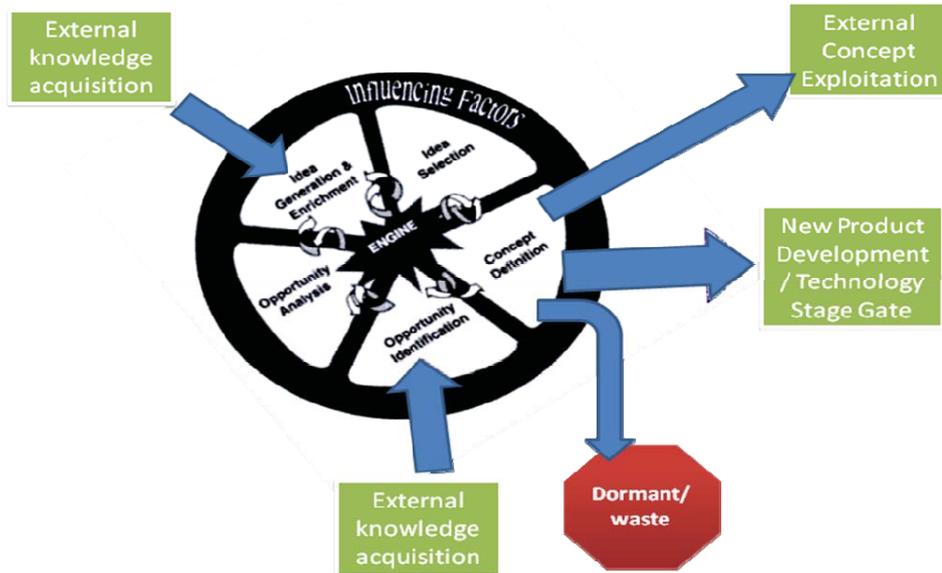


Figure 2. Applying an open innovation perspective to the New concept development model (adapted from Koen et al. [35])

Below is an example in the form of a table, Table 2., for how a firm might deal with some variant cases of technology concepts that come up in the fuzzy front end. There are a few points worth noting in the table. First of all, in addition to evaluating only the technology's potential itself, important considerations are also the fit to the business model as well as fit to the core competences of the company. Together these provide some indication of overall strategic fit, although it is far from synonymous to actual strategic fit, which should also be considered as a separate point. Secondly, only those ideas that fit well with the business and which the firm is able to develop well on its own are taken into the internal NPD pipeline, just as in previous models. The key difference here is that only the models with weak inherit potential are completely discarded or set dormant. When the firm does not

have the necessary core competences for a specific concept, but sees its value in complementing the current business model as significantly positive, it should opt to obtain a technology partner to assist in development; meanwhile also obtaining needed competences by learning effects in the course of cooperation. If the situation is the opposite, so that the development of the technology would be right in the company's core competence area (and indeed it might be the only company able to develop the technology so efficiently), but for some reason it does not fit into the current or planned business model, the company may opt to develop it for external commercialization (by licensing or even outright sale of the technology to another organization). If both areas are weak, but the technology holds great potential, it should be released to external concept exploitation, as described above.

TABLE 2. HOW TO DEAL WITH DIFFERENT TYPES OF CONCEPTS IN THE FUZZY FRONT END

Technology Potential	Fit to business model	Fit to core competences	Exploitation of concept
High	High	High	Internal NPD
High	High	Weak	Partnership
High	Weak	High	NPD -> Ext. commercialization
High	Weak	Weak	Ext. concept expl.
Weak	Low / high	Low / high	Waste / dormant

Open innovation practices in the fuzzy front end need not and should not limit to pursuing short-term monetary benefits. In the modern landscape of innovative competition knowledge is a highly valuable commodity that can be

leveraged to provide longer term strategic benefits as well. Proactively managing knowledge in- and outflows in the earliest phases of product and technology development allows the company a multitude of new strategic options.

Strategically managing the concept development and selection in the fuzzy front end can be done with the aim of producing knowledge that can be used to e.g. attract access to sought after networks, to build skills and competence in new areas through leveraging external partners and even thus enabling the search for new business opportunities in markets outside the current business. Overall, the open innovation perspective and consideration of all the options available allows making a shift from a “just profit” evaluation of the concepts to a more strategic, long-term control over the company’s future.

V. FINDINGS AND CONCLUSIONS

Researching the fuzzy front end theory, that was considered to perhaps hold the most promise in boosting the innovative processes of firms in the nineties, and the Open innovation theory that is seen today as the new wave of cutting edge innovation theory that is in even touted as the superior model for current business, we made interesting findings. It has already been established in literature that the theories indeed do have some overlapping ideas such as the utilization of external innovation sources to boost innovativeness and idea generation. However, our primary findings reside in the much less explored area of external technology exploitation and its implications when combined to the Fuzzy Front End. Here we introduced the notion of external *concept* exploitation (to distinguish from external *technology* exploitation) referring to the profitable externalization technology or product concepts that have not yet qualified for the internal new product development pipeline.

In the modern innovation landscape embracing the external options available in the front end of innovation will result in better cost effectiveness, better success rates, and an increase in strategic options available to the firm. We built upon the new concept development model of fuzzy front end theory and integrated practices from open innovation that have previously been associated only with the actual new product development phase of the innovation process to build a new framework for managing the fuzzy front end in “open” companies. The chief benefits of the proposed framework are reducing unprofitable Kill decisions in NCD, reducing concept waste, enabling external concept exploitation and increasing proactive, strategic management of FFE concepts.

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