Intellectual Property in the Era of Increased Clock Speed: Return of Knowhow?

Juha Saukkonen, Mauno Harju and Pia Kreus
JAMK University of Applied Sciences, Jyväskylä, Finland
juha.saukkonen@jamk.fi
mauno.harju@jamk.fi
pia.kreus@jamk.fi

Abstract: Growth-aspiring companies with a technological edge operate in an environment of ever-increasing clock speed. The life cycles of solutions have shortened. Virtualisation and digitalisation further increase the pace of product and service development. This trend requires agile development. Companies have to manage the speed requirements and increased uncertainty. New concepts like customer development (Blank, 2008), lean start-up (Ries, 2011) and minimum viable product (MVP) are common in new venture development. The new processes partly contradict the idea of proprietary knowledge, in which a company needs to rigorously keep track of knowledge creation, protection, development and dissemination. To achieve the freedom to operate, a firm needs knowledge artefacts such as patents, design rights and copyrights. The distinctive knowledge protected by IPRs is a fundamental element in the foundation of a new company and its resourcing. However, IPR processes tend to be heavy, they require a lot of time and resources compared to the plethora of solutions on which companies work. They are also 'heavy' with respect to the speed which is required from innovation process. New knowledge is often born in a multi-party and loose network relationship, where the ownership of knowledge is potentially unclear. This conceptual paper draws together prior research on the forces affecting IP approaches and processes in the new operating environment. We also discuss the existing implications and potential continuum of recent development. The cases highlight the theoretical findings of new knowledge dynamics for firms. Focusing on process rather than product knowledge – close to the "dormant" concept of knowhow – seems again to be of value.

Keywords: IPRs, protection, competitive advantage, growth, innovation

1. Introduction

The business environment for innovative companies contains elements and forces that are seemingly contradictory to each other. Demands of shorter time-to-market as well as agile and collaborative development need to be fitted with the creation and protection of unique knowledge that acts as a basis of differentiation and furthers the maximisation of the *competitive advantage gap* (Moore et al, 2000).

Simultaneously, a firm must seek ways to extend the *competitive advantage period*, i.e. the time it can preserve this uniqueness. The ways of achieving the latter target include e.g. the creation of systemic products, customer-lock-ins built into a business model and establishing intellectual property rights (ibid.).

This paper summarises the recent research on the new environment for innovation practices and resulting IP actions. We aim to contribute to the understanding of knowledge dynamics especially in the context of growth-aspiring knowledge and technology-based companies. Through cases, we also aim at offering the practitioners within innovative companies an indication of development issues that would allow them to better cope with the new landscape of innovation and IP.

Chapter 2 reviews the prior research in the subject, highlighting the two major forces affecting innovation in our era: Increased speed and uncertainty. We also discuss the answer to those calls; the shift towards collaboration, process view and contractual approach on innovation. Chapter 3 presents business cases that the authors have been involved in or followed from a close distance. Chapter 4 summarises the paper's contributions and proposes direction for further research.

2. Literature review

2.1 The new context of speed

In 1998, Charles Fine introduced the idea of increased clock speed. Even the oldest innovation theories like Schumpeter's recognise the waves of change that shake companies and industries. The idea of the increased clock speed states that these waves happen with increased density and unpredictability (Fine, ibid.). One effect concerns the life cycles of individual technologies and innovative products. From the upstream of the value chain, research & development and productisation, the produced goods nowadays are unique or custom-

designed, the competition is global and the goods produced in smaller quantities (Slusarczyk and Golnik, 2015; Kovacs and Kot, 2016; Gereffi, 2011). Companies have shorter development lead times and reduced costs, but these are balanced with shorter lifespans of the individual products, thus squeezing the window of revenue creation. Innovative products are prone to technological and/or functional obsolescence. A product becomes out of date because consumers turn their interest towards products with improved performance and better technology (Rai and Terpenny, 2008; Rivera and Lallmahomed, 2016). The uncertainties and volatilities are not only related to the technology and the products based on it, but also to the market size and behaviour. Also the intensity and tactics of the competition is volatile. (Mohr et al, 2010).

In dealing with the new demands for innovation processes, the rise of new technologies, business processes and global supply chains has been one answer (Gereffi, 2011). This, however, has been a double-edged sword, since, as Sandborn remarks, technology-centric products contain physical parts, software and materials whose procurement lives end before the product they are in reaches the end of its life cycle (Sandborn, 2017). Solving the puzzle of one´s risk by added technologies only adds to the complexity, yet provides no real solutions.. Technologies do add functionality and value, yet fast-moving technologies make products obsolete more quickly (Rai and Terpenny, 2008). The current business environment requires a *reduced total cost of development and shorter time-to-market* to cope with the uncertainties that are built in to the market dynamics.

To keep their competitive edge, technology firms and knowledge-intensive businesses need not only to deliver radically new *products* but also deliver them by radically different *processes*. According to Banu Goktan and Miles (2011), "radical product innovation development was not negatively related to innovation speed. Results revealed a significant relationship between radical product innovation and innovation speed" (p. 533). They claim that improved processes may be the key constituent to dynamic capabilities, enabling the creation of radical innovations in a timely manner. Firms have put increased emphasis into improving development cycle times (Akroyd et al., 2009) in order to deliver products to the market quickly and be early movers in their industries and market (Akroyd et al., ibid.; Karlsson and Ahlstrom, 1999). Hairman and Clarysse (2007) suggest that time-consuming product development is also money-consuming (in accumulated development cost) for organisations. Naturally, an extreme cost associated with not hitting the timely window of market opportunity is losing said market. Afonso et al. (2008) warn of the flip side of the speed coin: When time-to-market is seen as the key to profitability, development managers have no time nor attention span to consider alternatives. Instead of finding the best solution, the aim is to find at least one solution.

2.2 The new context of cooperation

Innovation in our era is a cumulative and additive phenomenon. Accumulation of knowledge is a dominant feature of modern innovation (Schankerman, 2016). Revolutionary findings require system-level activities where knowledge is built on knowledge (McKenna et al., 2018). The novel steps in technology generate knowledge spillovers that enable further advances. This may lead to knowledge strategies where the firms turn their focus towards innovation and IPs held by others to avoid the risks of obsolete development efforts of their own. This dilemma of whether a company should 'focus,' i.e. invest their effort and resources on the utilisation of knowledge vs. creation and exploration of new knowledge, is inevitable. Working in both extremes is likely to lead either to exaggerated cost vs. future value (in case of exploration-focus) or to loss of differentiation and thus future opportunities for value creation (in case of utilisation-focus). The sweet spot is somewhere along the continuum where the two approaches merge (Simone, 2011).

To exploit the cumulative nature of technological development, companies need to collaborate and integrate their development targets and processes. The mode of collaboration called supplier integration refers to processes where suppliers are involved in organisations' innovation processes and the execution of holistic innovation tasks. Research has redefined supplier integration into two dimensions: 1) product integration, where suppliers carry out product engineering and design activities on behalf of the customer (Koufteros et al., 2005) and 2) process integration, where the supplier is engaged in the development of processes that can be effectively integrated with the design (Koufteros et al., 2007). Logically, knowledge management research has identified *relationship capital* as a knowledge asset for firms (Edvinsson and Malone, 1997; Nahapiet and Ghoshal, 1998). The other elements of a wide view on Intellectual Capital (IC) are *human capital and structural capital* (Kianto et al., 2014). Other subsegments of IC are *renewal capital* in terms of innovative solutions, products and services available (e.g. Kianto, 2008), *trust capital* in terms of the trust embedded in its internal and external relationships (e.g. Mayer et al., 1995) and *entrepreneurial capital* in terms of capabilities and

mindset for entrepreneurial activities (e.g. Erikson, 2002). These areas of intellectual capital are not mutually exclusive; for example the collaboration of separate corporate entities has the potential to impact most if not all of the elements mentioned. The effect on IC can also be negative. Collaboration naturally poses challenge of proprietariness on the innovations and may even put the competitive advantage at risk, since the efforts can and will be partly utilised outside firm itself. Dutta and Hora (2017) state that partnerships in the upstream layer of value chains have a positive impact on invention success (novel solutions) but no significant impact on commercialisation success. This indicates that the return on relationship capital can in many is low. On the other hand, the effect of downstream partners is positive for both invention and commercialisation success (ibid.), Thus, collaborative practices can improve the firm´s knowledge exploitation despite the risks associated.

2.3 State of IP systems in the high clock speed era and proposed improvements

The most visible and unified IP process for today´s innovative companies is that of patenting. Patent systems have, however, long been debated. Scholars, researchers and practitioners propagate both for and against the current patent framework, its support vs. prohibition of advance and its suitability for the modern era (see chapters 2.1. and 2.2. above).

Technological innovation is an uncertain endeavour. One estimate states that 3,000 raw ideas produce one substantially new product and business success (Stevens and Burley, 1997). Naturally, not all of these ideas will move from firms' internal processes to patent application procedures, let alone be granted a patent. The number of patents granted versus R&D investment in money is an often-used indicator of efficiency of innovation activity (e.g. Johansson et al., 2015). Still, the hit rate of patents granted to commercial success is low at best – estimates of mere 1-3% of patents creating commercial value over the IP process costs are published as indicators (e.g. Key, 2016). On the other hand, new approaches such as strategic patenting (Baldus and Heckmann, 2016) question this type of straightforward benefit calculation. In strategic patenting the commercial value can be contributed to patents only if they have the potential to actually hit a target, e.g. a competitor. Reflecting this phenomenon, the knowledge ownership gets challenged increasingly often. Both in the UK and US the number of patent litigation cases has grown over 100 % between 2005 and 2015 (WIPO, 2018), In the same time span, number of patents and applications went up by some 60%. Every fifth patent application is filed by an SME (WIPO, 2018) that typically has resource limitations in their innovation and IP process.

The above-mentioned statistical indicators, when paired with the risk of knowledge leakage via non-disclosure pose a set of questions to innovative companies: 1) Is the engagement to formal IP processes a correct choice ? 2) If yes, what inventions are worth it when balancing the time and cost with the needs of market entry time and market value of the invention? 3) Are there options that solve the needs of a growth-seeking company better than the current IP practices? The decision of which technological option(s) to bet on carries a risk for a firm. For example, ICT market research and consultancy firm Gartner targets strategic planning and innovation by highlighting a set of technologies that will have broad-ranging impact across the business (Fenn, 2011).

Whereas the aggregate hype cycle contains some 50 technologies (or better: technology areas), their current development stage and expected timeline to full market presence, there are altogether close to 2,000 individual technologies on Gartner's radar. In addition to uncertainty on technology, the market and competition are also highly uncertain for new technology companies, multiplying the risk of failure (Mohr et al., 2011).

Supporters of strong patent systems with lengthy process times but also with long protection provided point out the impact on innovation activity and progress of science. IP is a core element in firms' ability to extract value and gain resources from market and investors. Successful development of new technologies is a costly and risky process that typically requires financial backing and assistance from third parties, to whom the assessment of future value is difficult (Hsu and Ziedonis, 2008). The mechanisms that shape outsiders' expectations include e.g. entrepreneurial lineage, founder backgrounds (Eisenhardt and Schoonhaven, 1990; Burton et al., 2002) and affiliations with reputable venture capitalists (Hsu and Ziedonis, 2008). Those value a firm by estimating the probability of a firm to succeed, given a set of characteristics of the organisation (Stuart et al., 1999) such as the presence of IP quality indicated by knowledge recognised by the patent system. Hus and Ziedonis (ibid.) found out that patenting can positively affect investors' perceptions of start-up quality across multiple stages as measured through intermediate venture valuations and the likelihood of an IPO

(initial public offering). Hsu and Ziedonis see this result as consistent and confirming with the earlier views of patents providing a vehicle for avoiding early-stage disclosure problems in the market of ideas (Arora et al., 2001; Gans et al., 2002). Ferri at al. (2019) found that the number of patents (in academic spin-offs) is a positive driver of performance, whilst a patent's age has no significant impact on growth. Despite the cumulative nature of innovation discussed earlier, the market opportunity for an individual invention is constrained by time. Patents assist trade by protecting buyers against the expropriation of the idea and by easing and increasing information sharing during negotiations through the publication of details (De Rassenfosse et al., 2016). However, there seems to be a lack of academic research on the profitability or efficiency measure rate per filed patent applications.

There are also critical notions on the current IP systems. Innovators and IP holders often fail to profit from innovations (Teece, 1986). Innovators often fail to possess the necessary assets and complementary skills beyond their own IPR and ability to move down the value chain (Lamin and Ramos, 2016). Some successful firms started as ''copycats'' (Williamson and Yin, 2014) or "imovators" (Shankar, 2010) and later transformed to be innovative on their own. De Braak and Deleersnyder (2018) learned that copycat followers (in form of private label versions) outperformed original innovators when measured as growth of market share of a product category. These tendencies indicate that innovation processes need to be improved with organisational routines to properly deploy IP (Steensma, Chari and Heidl, 2016). Scuotto and Shukla (2018) provide a suggestion to scholars to extend their analysis from imitation and/or innovation strategy to a combination of both views.

Chesbrough (2006) claimed that firms developing new technologies mostly pursue protective measures on innovation, seeking freedom to operate in the market. By their nature, patent systems restrict public access to inventions, but it may actually harm future technological progress by impeding firms from building on prior knowledge (Scotchmer, 2004). Conversely, if the patent system offers too little protection, the public not only loses just one invention, but also its future offspring. According to Roin (2013), providing enough protection to motivate innovation activity is critical, but providing too much protection will lead to stifling of innovation.

One of the potential solutions to the identified challenges has included tailored patent awards (Roin, 2013) that would shorten the innovator's time of operational freedom but still grant enough of a timeframe for the innovator to profit from the innovation - while letting others build on the original innovation in a meaningful way. This approach, however, builds on the idea that future value is assessable early on, which is judgement difficult to make.Another stream of development is the shift from the 'products of innovation process' to the process itself. Blank and Newell (2017) propose that organisations need a self-regulating, evidence-based innovation pipeline, a process that operates with speed and urgency, and that helps innovators and other stakeholders elaborate on and prioritise ideas and technologies. *Open innovation* built on multiparty sharing of knowledge is one such process. This view builds on the concept of the Innovation Funnel (Dunphy et al, 1996), in which a company moves from a vast number of opportunities to a limited number of launched/rolled-out features and products (see Figure 1).

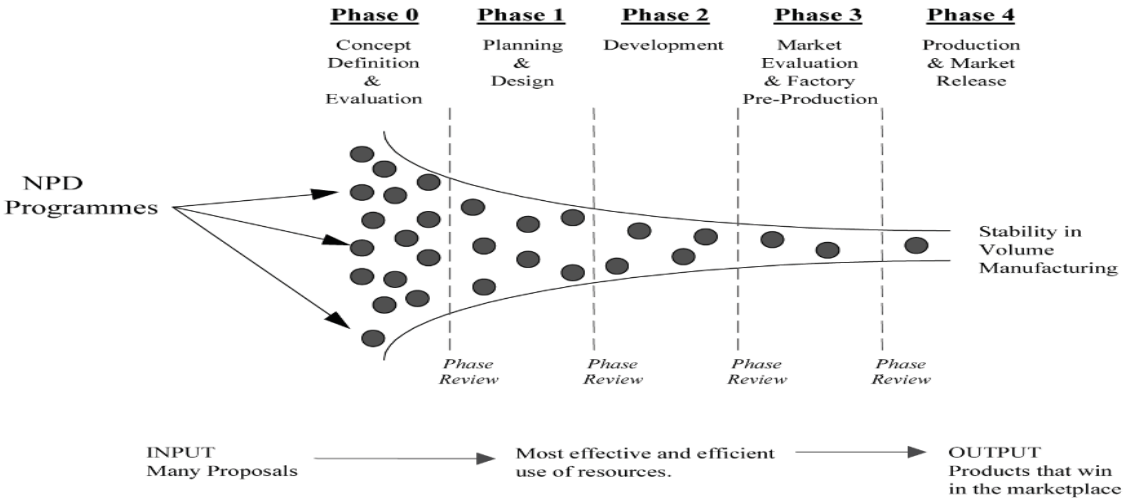

Figure 1: Innovation Funnel (Anthony & McKay, 1992)

The internal New Product Development model can be widened to the external environment (Figure 2). The company collaborates with its environment across company boundaries through stages of development.

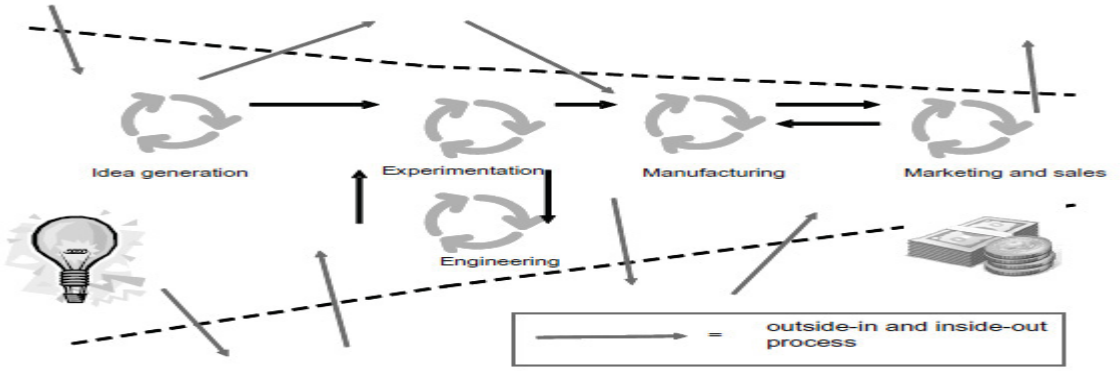

Figure 2: The New Product Development Model (Phillips, 2011)

Another development area has been a compromise between closed and open innovation (see above) that could be called *selectively open process controlled by mutual agreements*, where a company uses broadly described conditions for cooperation and co-development with selected counterparts. The parties involved agree to reveal some and protect other parts of their IP during the cooperation. The Letters of Intent can e.g. present plans for preserving and improving current capabilities, jointly meeting the challenges and taking advantage of operating critical resources (e.g. Atlas, 2012). Witek (2000) noted that letters of intent (LOIs), memorandums of understanding (MOUs) and similar documents were in the past used rather sparingly and in narrow transactional circumstances. Nowadays, LOIs are a common element in transactions such as software licenses, joint development agreements, manufacturing services agreements, intellectual property licenses, etc. LOIs and MOUs are used to set some form of managerial frame to undefined outcomes of joint processes.

3. Recent phenomena of focus shift – a multiple case analysis

3.1 Case 1: Pace of market opportunity opening vs. IP process

The IP creator, a Finnish institute of Higher Education, started a "Research into Business" project based on the invention of a novel solution for safety systems in vehicles. The project was assigned public funding for 16 months of duration, with the aim of charting its market opportunities and value chain structure for the future market launch. In this case the activities were divided into four sections that proceeded in parallel: 1) IPR = Patent application preparation, 2) Laboratory and field work to test the solution and understand potential use contexts, 3) Performing (via desk study and purchased research reports) market analysis, and 4) In one-to-one encounters with recognised value chain actors.

The process of getting IPR artefacts in place (patent application and resulting national priority date) lasted to the very end of the 16-month process. Since the invention did not enjoy any degree of protection, section 1 as a result did not provide support to stages 3 and 4. In practice, the early market studies (section 3) revealed the key players and their relative importance, even down to key individuals in those companies as well as events in which to meet them. However, the contacts were unable to take any stance or point at a suitable pathway without knowing some basic details of the innovation. This was not possible, as the discussion on the core innovation would have provided direction to competing research by the value chain actors. The length of the IPR process was thus incompatible with go-to-market plans. The need for higher process speed was further underlined by the fact (revealed in work done in section 3: market analysis) that one of the largest overseas markets was renewing its legislation related to the product category in just 2.5 years´ time from the start of the project. The delayed industry contacts meant that the solution misses the first wave of market adoption.

To avoid these pitfalls, the party possessing the proprietary knowledge could have potentially tried to safeguard the unique knowledge by contractual means (letter of intent, memorandum of understanding, non-disclosure agreement, etc.).

3.2 Case 2: Loss of IPR due to overtrust, i.e. jumping over process steps in knowledge creation

The supplier of components to the specialised working machine/vehicle industry was engaged in a longer-term development project with their main customer. To their surprise, when the supplier began the internal

preparation for the patenting process and started screening for competing solutions, a patent application had already been filed for the jointly developed invention, in the sole name of the customer. Claiming a fair share of the paternity rights for the innovation was not possible without putting the key customer relationship for the main product line of the company under serious strain. So for now, the supplier's knowledge is applicable only to a part of its market potential.

This case underlines the role of early involvement in the process with agreements and clear guidelines when working with external knowledge resources. Even when acting in an Open (or Joint) Innovation environment, the ownership can't be a free catch to the most agile party. All in all, there is a powerful case to be made for strong contractual framework on knowledge creation, dissemination and protection.

3.3 Case 3: Value of meta capabilities – knowledge on knowledge and innovation on innovation – corporate acquisitions of innovation process expertise providers

A recent phenomenon related to innovativeness and innovation capabilities has been the wave of corporate acquisitions by major ICT technology providers and consulting companies, in which they have fortified their innovation process knowledge capabilities. In 2016, an Indian ICT giant acquired a Danish innovation champion at a price that was threefold to the sales revenue of the acquired company. The acquired company has 9 patents (as retrieved from the Espacenet database 8.2.2019) in their own name, but those patents have little to do with the core business of the acquirer. The French ICT/concluding conglomerate GapGemini, in its turn, acquired the Finnish-originated innovation process champion Idean Enterprises at an estimated price of 75 million euros, which equals about tenfold the sales revenue of the latter (Talouselämä ("Business Life"), 2018).

Though Idean has just 2 patents granted in its name, it possesses innovation and design process expertise with a global customer base.

The rationale of the latter acquisition was according to the buying party that "customer demand is shifting; service providers who bring digital design, creativity, and agility to redefine the customer experience are developing a strategic dialogue with their clients, driving uniquely differentiated outcomes" (CapGemini, 2018).

3.4 Summary of the case examples

The cases presented and analysed above differ in the industries where they occur and in the size of the companies involved. Still, they point out the same dilemmas as the literature review (Chapter 2), namely that the balance of closing vs. disclosing information and the practical action to maintain that balance is a delicate act. Overtrusting the fairness of innovation partners can lead to the loss of IPR and hurt future business value. On the other hand, fear, lack of trust and/or lack of contractual and practical ways to allow a certain level of information disclosure in business relationships can lead to missing the market opportunity entirely and render the knowledge obsolete. The focus on innovation processes instead of their tangible results is also gaining increasing interest and business value.

In the three unique cases happening during a one year timespan inside one local innovation environment in Finland, both similarities and differences in presence and impact of different Intellectual Capital consituents and driving forces got demonstrated, as the summary table 1 below shows.

source and impact / cases	Knowledge asset driving the case originally	Knowledge asset impacted by the case development	Impact of IP process to the case (magintude)	Impact of IP Process to the case (qualitative)	Correlation to the New Context of Speed	Correlation to the New Context of Collaboration
Case 1: Missing time-to-market for not having IP´s in place	• Entrepreneurial Capital • Renewal Capital	• Relationship Capital • Structural Capital	High	Short-term: Negative Long-term: Positive	High	High
Case 2: Loss of jointly developed IP to a key customer	• Relationship Capital • Trust capital	• Relationship Capital • Trust Capital	High	Short-term: Negative (for the case company) Long term: n/a	Low	High
Case 3: Acquisition of an Innovation Process – concept owner	• Human capital • Relationship Capital	• Human capital • Structural Capital	Low	Neutral	High	High

Table 1: Summary of the case analysis

4. Conclusions and discussion

This paper highlights the shift happening in the sphere of knowledge management. The new innovation environment requires fresh angles to firms´ innovation capabilities and practices. Current development is an extension to the continuum where the *success probabilities for individual innovations are low, competition for a market-capable solution is intense* and shifts both in customer demands (pull) and supplier´s capabilities (push) are frequent and *change speeds are accelerating*. The current clock speed of evolution and the components contributing to it (technological advance, hypercompetition and shortening windows of opportunity) are causing challenges to especially novel and resource-constrained firms to engage into formal IP processes. They need to seriously assess their resources and capabilities as well as the business viability of the traditional formal IP processes with long lead times and high uncertainty.

In the new paradigm, the *modus operandi* leans towards at least two directions that appear to be partial resurrections of old practices. The first direction is a step back from the widely popularised philosophy and practice of open innovation. In his stream of development firms deploy policies and practices where, by means of contractual knowledge artefacts such as MoUs and LoIs, the process leaves room for joint, continuous and, to a certain extent, non-destined innovation. Simultaneously, the process safeguards each parties' proprietary rights for IP and input to the multiparty process.

Secondly, the importance of innovation processes *per se*, a constant flux of new ideas subjected to testing and analyses, is highly valued. The concept of *knowhow* has been dormant for some time – the number of scholarly articles containing the word 'knowhow' in the title has been just 5-15 annually throughout the 2000s. Partly, this may be due to the evolution of new terms such as process knowledge. Another reason may be a further division of the original term to new concepts such as know-who, know-where, etc. (Simone, 2011). Based on our observations, knowhow seems to be regaining strength back from the 'know-what' mindset of innovation management. The modern knowhow is seen as an internally and externally joint effort. However, the advantages of knowledge pooling with partners need to be balanced with the risks on proprietariness of knowledge.

We propose that firms need to operate on multiple fronts of intellectual capital in order to fully exploit their knowledge assets. The levels on which a company is in different subareas of intellectual capital (IC) have an effect on operational modes it can apply. And reciprocally, the different IP actions performed have a differing impact on IC. The current formal IP processes are still an option (with their advantages and disadvantages) for growth-seeking innovative companies, but companies search and practice already alternative ways.

This paper aimed to present a conceptual overview with cases chosen as examples to link the conceptual considerations closer to practice. Further research with a wider sample, deeper data and a unified practice of

approaching cases is needed. In business, everything boils down to business viability, i.e. long-term value creation. To achieve that, research should also longitudinally approach the topic to see the full business effect of different strategies in IP policies and processes.

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