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# PRODUCT DEVELOPMENT METHODS WITHIN THE ICT INDUSTRY OF LATVIA

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**Abstract**
The purpose of this research is to examine information technology and communications (ICT) product development methods and management principles within the ICT sector of Latvia. This paper introduces definitions of innovation and startup, identifies the main product development methods used in order to develop innovative products with high added value, and examines other methods used by the established enterprises to develop new products. Literature review is supported by findings from semi-structured interviews with 10 international ICT industry experts. Research results suggest that the most common ICT product development methods are related to Lean Startup frameworks by Blank (2010, 2018), Ries (2008), and Value Proposition Canvas by Osterwalder (2010). The specifics of ICT companies focused on software development are related to use of Waterfall, Agile, Scrum and Kanban methodologies. Established enterprises are likely to use such methods as internal incubators, internal and external hackathons, and even setting up of external venture fund in order to scout relevant innovations and technologies in early development stages to be commercialized and added to their business portfolios.
KEY WORDS: innovation, startup, ICT, product development, lean, agile

## Introduction

The research of ICT sector is important due to its growing contribution to Latvia's GDP. In 2016, the turnover of ICT sector enterprises in Latvia has reached 3.47 billion EUR in 2016, almost doubling from 2009 when it was 1,82 billion EUR, and thus contributed 14% of country's GDP of 24,925 billion EUR in 2016, an increase from 9,7% in 2009 (Central Statistical Bureau of Latvia, 2018).

1,67 billion EUR or 48% of this turnover is created within ICT services activities category, 1,52 billion EUR or 43% is generated by ICT wholesale, and 281 million EUR or 8,1% is generated by ICT manufacturing activities. The focus of this research is on the ICT services activities segment that contributes almost half of entire ICT sector and has shown steady year-over-year growth (See Fig. 1).

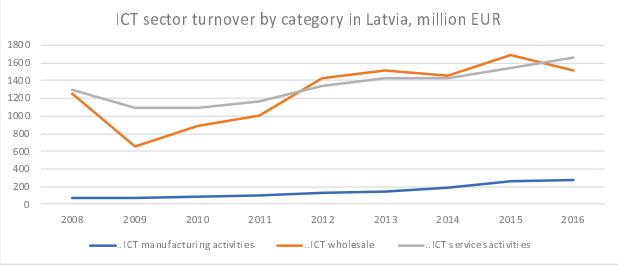
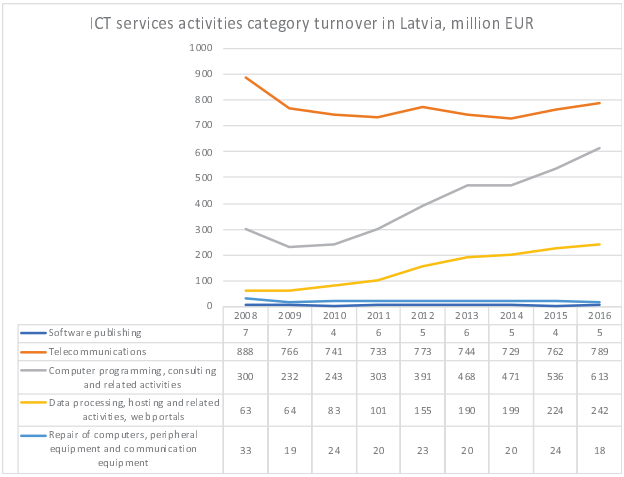



**Fig. 1.** ICT sector turnover by category in Latvia. (Central Statistical Bureau of Latvia, 2018)

Further analysis of ICT services activities category reflects that the highest contribution is brought by Telecommunications segment (47,3% or 789 million EUR in 2016), which has been fluctuated around this level without much change since 2009. It is followed by rapidly growing Computer programming, consulting and related activities segment (36,8% or 613 million EUR in 2016), reflecting increase of almost 3 times since 2009 when it was at 232 million EUR level, and Data processing segment contributing 14,5% or 242 million EUR in 2016, increase of almost 4 times from 64 million EUR in 2009 (see Fig. 2).




| | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| Software publishing | 7 | 7 | 4 | 6 | 5 | 6 | 5 | 4 | 5 |
| Telecommunications | 888 | 766 | 741 | 733 | 773 | 744 | 729 | 762 | 789 |
| Computer programming, consulting and related activities | 300 | 232 | 243 | 303 | 391 | 468 | 471 | 536 | 613 |
| Data processing, hosting and related activities, web portals | 63 | 64 | 83 | 101 | 155 | 190 | 199 | 224 | 242 |
| Repair of computers, peripheral equipment and communication equipment | 33 | 19 | 24 | 20 | 23 | 20 | 20 | 24 | 18 |

**Fig. 2.** ICT services activities category turnover in Latvia (Central Statistical Bureau of Latvia, 2018)

As noted by several telecommunication industry experts, the only possibility for telecommunications segment participants in Latvia to grow their business on top of rather saturated traditional telecommunications business lines (e.g. voice, cable Internet, etc.) is by introducing new product and service lines and come up with innovative solutions that would differentiate them from competitors.

The innovation management and new product development has become a prerequisite for survival and

improvement of competitiveness of almost every ICT sector company, but essentially for ICT services activities segment companies, because of rapidly evolving technological advancements and the speed at which new products are being delivered to market by both, start-up companies and also well established and mature corporations. For telecommunications companies the innovations and new product development is a question of survival, while for other companies – the growth opportunity.

The continuous increase of computer programming and data processing segment turnovers is just a logical consequence to growing importance of ICT as embedded part of any business. As noted by Andreesen (2011), almost every company is becoming a software company: "Software is eating much of the value chain of industries that are widely viewed as primarily existing in the physical world. In today's cars, software runs the engines, controls safety features, entertains passengers, guides drivers to destinations and connects each car to mobile, satellite and GPS networks. The days when a car aficionado could repair his or her own car are long past, due primarily to the high software content. The trend toward hybrid and electric vehicles will only accelerate the software shift — electric cars are completely computer controlled. And the creation of software-powered driverless cars is already under way at Google and the major car companies".

Therefore, ICT industry and sector as such is likely only to increase in the nearest future, and the challenge is to identify the ways for ICT companies to launch innovative products and successfully manage innovation creation in long run to maintain competitiveness in long run.

## Research methodology and organization

This study is a result of a systematic literature overview by analysis of scientific articles, monographs, conference materials and other relevant literature. In addition, expert opinions were gathered during 10 expert interviews with senior ICT company executives and representatives of ICT industry stakeholders (academic, startups, venture capital, NGOs, etc.) in Latvia and USA.

In total 10 experts representing various ICT industry stakeholders were approached between September 2017 and July 2018. The list of experts, reflecting information on the stakeholder represented, the position of the expert in the organization, and its country of origin, is summarized in Table 1.

**Table 1.** List of experts

| Nr. | Stakeholder | Position | Country |
|---|---|---|---|
| 1 | Academia | Managing director of alliances | USA |
| 2 | Academia | Manager of IP transfer | Latvia |
| 3 | Venture Capital | Partner | Latvia |
| 4 | Technology Scouting | Cofounder | Latvia |
| 5 | Startup | Cofounder | Latvia |
| 6 | Startup | Product manager | USA |
| 7 | NGO supporting startups | CEO | Latvia |
| 8 | Hackathon organizers | VP of strategic partnerships | USA |
| 9 | Telecommunications | R&D manager | Latvia |
| 10 | Telecommunications | Director of business development | Latvia |

During the semi-structured interviews and networking experts were asked to share their experience regarding general ICT product development trends, insights from internal and external innovation management practices in their own companies and ICT industry in general.

The research problem is related to need to distinguish between innovation and start-up concepts, describe the main innovation tools and product development frameworks used by employees to create new ICT products. The research objective is to identify methods used to introduce innovations and develop new ICT products with high added value.

## Theoretical background

According to Schumpeter (1934), the function of entrepreneurs is to reform or revolutionize the pattern of production by exploiting an invention or, more generally, an untried technological possibility for producing a new commodity or producing an old one in a new way, opening a new source of supply of materials or a new outlet for products, by reorganizing a new industry. This idea was elaborated further by management consultant Drucker, who was influenced by ideas Schumpeter. He stated that the innovation concept does not refer to company's age or size, but to a certain kind of activity, where at the heart of that activity is innovation – the effort to create purposeful, focused change in an enterprise's economic or social potential (Drucker 1985).

Rivette and Kline (1999) suggest that firms continuously generate new knowledge, develop a new intellectual capital in the form of copyrights, designs, know-how, patents, and technology demos that could be packaged into new products and service offers outside the traditional boundaries of existing business operations, and this is the true essence of innovation.

More recent research by Chesbrough (2003) has introduced concepts of open and close innovation, where open innovation refers to "combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies", thus, including a clear reference to the role of IT and technologies for innovation creation. The comparison of principles behind open and closed innovations is summarized in Table 2. This approach and categorization are regarded as one of the first attempts to show how a

company can use its business model to identify a more apparent role for R&D, better manage and access intellectual property, advance its current business, and grow its future business. Chesbrough shows how open innovation can unlock the economic value in a company's ideas and technologies by replacing the traditional model for innovation, which has been largely internally focused, closed off from outside ideas and technologies, and is becoming obsolete (Chesbrough 2003).

A clear distinction between invention, innovation and innovation management was introduced by Maital and Seshadri, who state that invention is "the creation of novel services, products and production techniques", innovation relates to "the practical refinement and development of an original invention into a usable technique or product, or, a process in which creativity is applied to every facet of an organizations value chain, from beginning to end, to develop new and better ways of creating value for customers". Innovation management is related to "the process of creating and implementing a business design surrounding a creative idea, with the goal of transforming an invention into an innovation, and ultimately to achieving sustained competitive advantage, leading to growth and profit, in the marketplace" (2012, 5).

**Table 2.** Differences between open and closed innovations. Source: Chesbrough (2003).

| **Closed Innovation Principles** | **Open Innovation Principles** |
|---|---|
| The smart people in the field work for us. | Not all the smart people work for us, so owe must find and tap into the knowledge and expertise of bright individuals outside our company. |
| To profit from R&D, we must discover it, develop it, 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 the market first. | We don't have to originate the research to profit from it. |
| The company that gets an innovation to the market first will win. | Building a better business model is better than getting to the market first. |
| If we create the most and the 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 others' use of our IP, and we should buy others' IP whenever it advances our business model. |

## Innovations in start-up vs. enterprise

In the era of Internet, the discussion on innovations is often related to the concept of a startup. Blank (2010) defines a startup as an organization formed to search for a repeatable and scalable business model. A business model describes how the company creates, delivers and captures value. A founder starts out with: 1) a vision of a product with a set of features, 2) a series of hypotheses about all the pieces of the business model: Who are the customers/users? What's the distribution channel. How do we price and position the product? How do we create end user demand? Who are our partners? Where/how do we build the product? How do we finance the company, etc.

The job of a founder is to quickly validate whether the model is correct by seeing if customers behave as your model predicts. Most of the time the customers don't behave as one has predicted. According to Blank, startup transforms into a regular company once it has found a sound business model, product/market fit, repeatable sales model and achieved cash-flow breakeven, become profitable and has replaced initial founder team with new senior management team. The change happens when startup focus shifts from the search of the business model to the execution of the business model (see Fig. 3) and this also corresponds to the previously introduced definition of innovations management by Maital and Seshadri (2012).

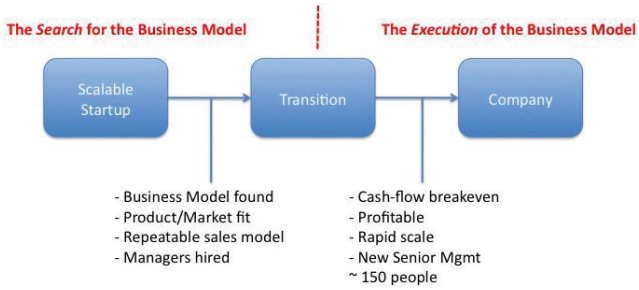



**Fig. 3.** Difference between a startup and a company. Source: Blank (2010).

The available statistics from Investment and Development Agency of Latvia (LIAA, 2018) show that there were around 350 startups in Latvia in 2017 from various industries, and their number is growing year by year. LIAA has included in this count only those startups that have attracted at least 50'000 EUR risk capital investment.

The startup concept in the context of innovation management is essential to consider since one of the strategies utilized by established corporations is a technology scouting and external search for innovative

new companies (startups) to be taken over through acquisitions or offered open partnerships for helping to contribute to development of innovative products and services by large corporates. According to Imaginatik and MassChallenge (2016), there can be different models behind partnerships between startups and corporations. Corporations and startups have begun working together in fundamentally new ways, with a focus on flexible, early-stage, open-ended partnerships. Early adopter corporations have been engaging with startups for many years, but behaviors are only now starting to change. The trend towards early stage interactions is pivotal. Most corporations are well-versed in acquiring startups (once the startup has already built and proven its value to the acquirer); yet, times are changing. A growing proportion of corporations now also seek flexible upstream partnerships with startups, in which both sides take risk and share in the rewards.

Imaginatik and MassChallenge (2016, 7) also indicate three different types of innovation objectives (see Fig. 4):

1. Improve core business: The simplest aim is to improve the core business—e.g., cutting costs, boosting margins, expanding market share.
2. Moonshot innovation objectives: focused solely on disruptive industry shifts and are often accountable to no one except the CEO and Board. Insurance companies, increasingly threatened by fintech and insurance startups, are a good example.
3. Technological or product innovation is the objective most familiar to many organizations: particularly in high-tech and engineering-heavy manufacturing industries.

| | Core Business | R&D Product | Moonshots |
|---|---|---|---|
| Objective | Leverage startup capabilities to improve operations, costs, or digital technologies within the core business(es) | Work with startups to accelerate new technology development / product innovation | Gain a foothold or strategic presence in disruptive new technology or market spaces |
| Staff | Project managers and startup scouts | Technologists, data hackers, startup scouts | In-house entrepreneurs, designers, marketers, startup scouts |
| Mode | Startups as business execution lever | Startups as technology/product development accelerator | Startups as disruptive ecosystem partners / accelerants |

Shared Service ⟵ ⟶ Autonomous Unit

**Fig. 4.** Three types of innovation objectives. Source: Imaginatik and MassChallenge (2016, 8).

Although most companies maintain a strict focus on one of the above objectives, it is becoming more common to manage a blended portfolio of objectives. However, doing so requires an associated mix of team skills, scaling levers, and types of relationships into and out of the mainline business. Most companies are still building assets required to coordinate a portfolio with that degree of sophistication (Imaginatik and MassChallenge 2016, 8).

## Innovation management

Drucker (1985) suggests that for company managers seeking innovation, engaging in disciplined work is more important than having an entrepreneurial personality. He describes the following major sources of opportunities for innovation on the company level: unexpected occurrences, incongruities of various kinds, process needs, or changes in an industry or market. Outside the company possibilities of innovation creation arise from demographic changes, changes in perception, or new knowledge. These seven sources overlap and the potential for innovation can be found in more than one area at a time. Those innovations based on new knowledge tend to have the greatest effect on the marketplace, but it often takes decades before the ideas are translated into actual products, processes, or services. However, this indicates only the possible sources of innovations, but not the entire sequence of activities to be implemented for comping up with a new business model for the innovative product or service and follow up with its proper management.

The findings by Echendu and Rasetlola (2011) suggest that there are two approaches to technology commercialization, which implies bringing the findings of either internally developed by R&D or externally scouted technology to the market: (1) a linear approach featuring sequential interactions and linkages, and (2) a functional approach where activities are not necessarily performed in any predetermined order or chronological sequence but follow the dictates of entrepreneurial flair.

Often established companies like large telecommunications corporations are launching sales of standardized and tested product lines using a linear approach with clear processes and structured project management flow, while for entirely new product innovation launch and unique technology commercialization the functional approach would be more suitable using methodology similar to innovation pipeline by Blank and Newell (2017).

Blank and Newell state that as organizations have moved from individual innovators working alone to

adopting innovation tools and activities and then to teaching teams about evidence-based innovation, the most important realization has been that having skills/tools and activities are critical building blocks, but by themselves are insufficient to build a program that delivers results that matter to leadership. It's only when senior leaders see how an innovation process can deliver stuff that matters at speed, that they act to change the processes and procedures that get in the way (2017).

It is noted that the next big step is to get teams and leaders to think about the innovation process from end-to-end – that is to visualize the entire flow of how and from where an idea is generated (the source) all the way to deployment (how it gets into users' hands) (See Fig. 5), including the following stages of pipeline (Blank 2018):

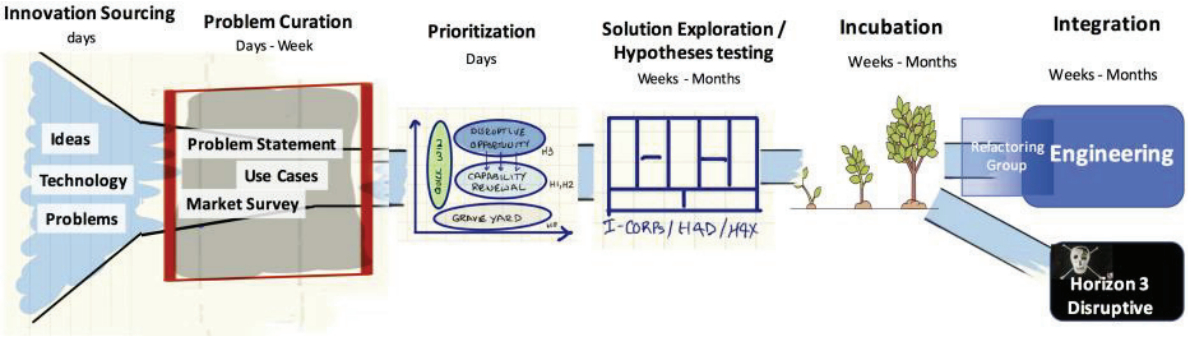



**Fig. 5.** Innovation pipeline. Source: Blank (2018).

1. Innovation sourcing: Over a period of days, a group generates a list of problems, ideas, and technologies that might be worth investing in.
2. Curation: For a few days or even a week, innovators get out of their own offices and talk to colleagues and customers.
3. Prioritization: Once a list of innovation ideas has been refined by curation, it needs to be prioritized. One of the quickest ways to sort innovation ideas is to use the McKinsey Three Horizons Model (Coley 2009). Horizon 1 ideas provide continuous innovation to a company's existing business model and core capabilities. Horizon 2 ideas extend a company's existing business model and core capabilities to new customers, markets or targets. Horizon 3 is the creation of new capabilities to take advantage of or respond to disruptive opportunities or disruption.
4. Solution exploration and hypothesis testing: This six to ten-week process delivers evidence for defensible, data-based decisions. For each idea, a business model canvas by Osterwalder and Pigneur (2010) needs to be filled out.
5. Incubation: Once hypothesis testing is complete, many projects will still need a period of incubation as the teams championing the projects gather additional data about the application, further build the MVP, and get used to working together. Incubation requires dedicated leadership oversight from the horizon 1 organization to insure the fledgling project does not die of malnutrition (a lack of access to resources) or become an orphan (no parent to guide them).
6. Integration and refactoring: At this point, if the innovation is Horizon 1 or 2, it's time to integrate it into the existing organization. Horizon 3 innovations are more likely set up as their own entities or at least divisions. Trying to integrate new, unbudgeted, and unscheduled innovation projects into an engineering organization that has line item budgets for people and resources results in chaos and frustration.

Blank and Newell conclude that innovation requires a rigorous process. It starts by generating ideas, but the most effort should be put in prioritizing, categorizing, gathering data, testing and refactoring (2017).

## Findings from expert interviews

### Switch to open innovations

Majority of experts confirmed that ICT companies are very active in utilizing approach of open innovation and, instead of relying on internal R&D alone, are actively using external sources for innovation scouting, sourcing, acquisition and general partnerships. If historically the focus was on hiring the brightest and smartest employees alone, then nowadays the idea that if companies make the best use of internal and external ideas combined, they can outcompete isolated market players, thus confirming open innovation principles by Chesbrough (2003).

### Internal activities

Common methods for internal innovation sourcing relate to creation of idea banks, where employees can submit their ideas, organizing of so-called "hackathons" in length from 48h to several months to generate and test hypothesis for innovation creation, and also creation of internal incubators where employees can work at their initiatives in parallel to their daily duties.

Demand for such activities has created a new segment of service providers who offer internal and external,

offline and online hackathon management for any customer from ITC and related industries. One of the leading global hackathon organizers are AngelHack, based in USA, while in Latvia such services are offered by accelerator and consulting like StartupWiseGuys (based in Estonia), Garage48 (based in Estonia), and Choice (based in Latvia) and other.

## External scouting

Experts noted that in case of larger ICT companies it is common practice both, worldwide and in Latvia, to use also external scouting to identify possible innovations in the market. Similarly, to hackathon organizers, there are numerous companies offering innovation scouting worldwide (e.g. The Floor for fintech solutions (based in Israel), Vertical VC for variety industries (based in Finland), etc.)

On the other hand, one of the largest Latvian telecommunications companies Lattelecom has used approach of establishing an independent investment fund Overkill together with several partners to focus on start-up acceleration by providing support to those technology startups that could be possibly aligned with general corporate development strategy of Lattelecom and M&A activities.

## Partnerships with academia

Academic institutions like Massachusetts Institute of Technology (MIT) have been historically cooperating with industry on fundamental research that has been properly developed further and transformed into commercially viable by spin-offs. In 2017 there has been signed an agreement between MIT and IBM corporation on 10-year partnership for joint research in the field of the artificial intelligence (AI), which implies forming of researcher group from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) and IBM that will collaborate to come up with fundamental research findings within the field of AI that can be transferred from academia to industry and commercialized by launching innovative products or services within ICT industry.

Another major partnership project by MIT was launched in 2018 to address issues related to advances in automating and digitizing financial services that have largely changed how we use technology to make fiscal decisions. MIT's CSAIL recently launched a research-industry collaboration focused on creating financial technologies that will be able to open up new business models, gain new data insights, and improve security. The initiative will span topics that include artificial intelligence, cryptocurrencies, blockchain foundation and applications, machine learning, multi-party computation for superior security and privacy, data management and analytics, natural language processing, and cyber-risk management, among others (Conner-Simons and Gordon 2018).

Some of telecommunications companies have implemented successful research projects together with the Latvian State universities for coming up with applied research findings that can contribute to technology commercialization and introduction of new innovations to the ICT market (e.g. LMT in co-operation with Riga technical University).

In addition, some State universities (e.g. Riga Stradins University, Riga Technical University) have established separate departments aimed to facilitate knowledge transfer and co-operation with industry for creation of new spin-offs.

Therefore, partnerships with academia can be regarded also as one of the ways for innovation sourcing and obtaining different inputs from new ideas to technologies.

## University incubators

Nowadays, most universities have own business incubators or labs to encourage students and researchers to provide the necessary support, financial aid and know-how for innovation commercialization to anyone having a viable business idea. For instance, The Harvard i-lab is a resource available to all current students from any Harvard school who is looking to explore innovation and entrepreneurship at any stage. It provides all the physical and intellectual resources current Harvard students need to develop and grow, including advising, office hours with industry experts, workshops, an incubator program, and competitions. Open co-working space is also available for any Harvard student looking to grow as an innovator (Harvard University, 2018).

Most of Latvian universities now have established business incubators with similar infrastructure and intent of providing the environment that supports development of innovative products, including those from ICT sector. Here students can obtain theoretical knowledge on innovation tools, necessary mentoring and access to business network, and receive financial support for their startup ideas.

## Innovation tools

Most of experts noted that nowadays it has become a rather common thing for ICT companies of different sizes from early startups to mature corporations use the startup innovation tools like Business Model Canvas and Value Proposition Canvas (see Fig. 6) by Osterwalder et al. (2010, 2014) for business model generation and hypothesis testing for validating assumptions behind possible innovation. These tools are commonly used also within business incubators where experienced instructors are educating entrepreneurs with little experience and previous entrepreneurial background to test their ideas and validate assumptions before starting actual development of product or service prototypes.

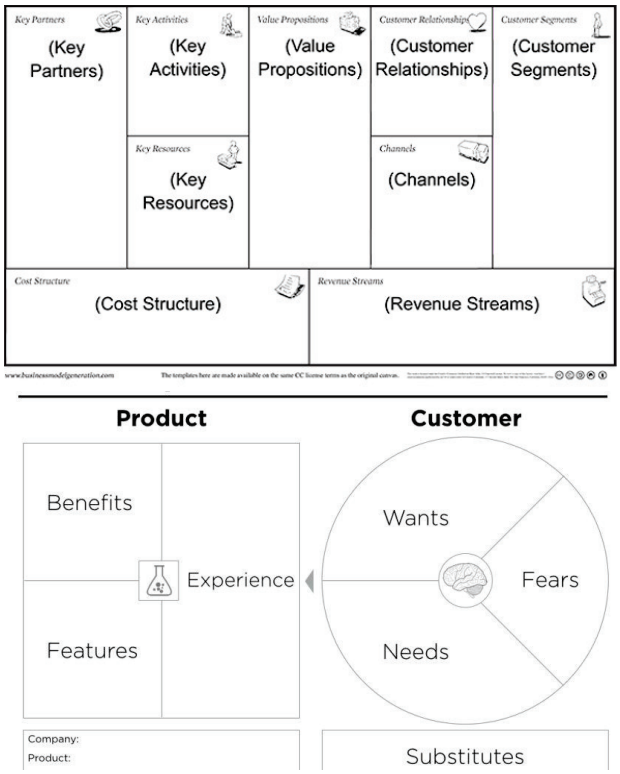



**Fig. 6.** Business Model Canvas and Value Proposition Canvas. Source: Osterwalder *et al.* (2010, 2014).

Another commonly used tool is a Kanban board - a work and workflow visualization tool that enables users to optimize the flow of the work. Physical Kanban boards (see Fig. 7) typically use sticky notes on a whiteboard to communicate project status, progress, and issues.


**Fig. 7.** Kanban board. Source: Leankit (2018).

The Kanban technique emerged in the late 1940s as the Japanese car maker Toyota rearranged its approach to manufacturing and engineering. Line-workers displayed colored kanbans (actual cards) to notify their coworkers that demand existed for parts and assembly work. Kanban is the Japanese word for "visual signal" or "card." The system's visual nature allowed teams to communicate more easily on what work needed to be done and when, and it also standardized cues and refined processes, which helped to reduce waste and maximize value (Leankit 2018). Experts noted that Kanban boards are more commonly used by startups and software development teams.

## Methods of software product development

Experts reflected that there exists difference between innovation scouting and sourcing methods for general start-ups, and the methods for product development in case of software engineering, which are commonly associated with innovations management, but actually represent how the process of their development is managed.

Experts outlined that the main approaches for software development historically utilized by ICT companies relate to Waterfall method (Royce 1970), which describes a method of development that is linear and sequential , and Agile methodology that follows an incremental approach and where developers start off with a simplistic project design, and then begin to work on small modules (Fowler and Highsmith 2001). The work on these modules is done in weekly or monthly sprints, and at the end of each sprint, project priorities are evaluated, and tests are run. These sprints allow for bugs to be discovered, and customer feedback to be incorporated into the design before the next sprint is run.

Larger ICT companies, particularly in software engineering, are providing so called “sandboxes” – the environment that can be used to develop software prototypes using application programming interface (API) provided by the host company. API is a set of protocols, routines, functions and/or commands that programmers use to develop software or facilitate interaction between distinct systems. APIs are available for both desktop and mobile environments and are typically useful for programming GUI (graphic user interface) components, as well as allowing a software program to request and accommodate services from another program (Techopedia, 2018). Therefore, sandbox can be considered as an innovation creation tool for software companies and also companies from other industries (e.g. financial) that are using IT systems for provision of their core services and that can be developed using input from external partners.

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## Conclusions

The growth of Latvian ICT industry is mainly due to increase of turnover in telecommunications segment followed by computer programming, consulting and related activities segment.

The research results suggest that the main new product development methods used by corporates and start-ups are related to use of Lean Startup methodology

originally developed by Ries (2008) and Blank (2010), which has been recently extended into Innovation pipeline by Blank and Newell (2017).

It is very common for companies of different sizes to utilize innovation tools like Business Model Canvas and Value Proposition Canvas developed by Osterwalder et al. (2010, 2014) for generation of ideas and testing of hypotheses for new business models to come up with innovations with commercial potential.

The methods related to product development at software start-ups relate to Waterfall (Royce 1970), Agile and Scrum frameworks and provision of so-called "sand-boxes" for enabling safe access to the infrastructure by external software developers for safe prototyping.

Larger companies are likely to use such methods as internal incubators, internal and external hackathons, and even setting up of external venture fund in order to scout relevant innovations and technologies in early development stages to be commercialized and added to their business portfolios.

The innovation sourcing, scouting and management methods used by ICT companies in Latvia do not generally differ much from those implemented by ICT companies worldwide. However, additional research is needed to analyse the nature of innovations management, similarities and differences between start-up companies and larger ICT corporations in Latvia.

## References


Amadi-Echendu, J.E., Rasetlola, R.T. (2011). 'Technology commercialization factors, frameworks and models', First International Technology Management Conference, San Jose, CA, pp. 144-148. doi: 10.1109/ITMC.2011.5995939

Andreesen, M. (2011). 'Why Software Is Eating The World', The Wall Street Journal. Available from: https://www.wsj.com/articles/SB10001424053111903480904576512250915629460

Blank, S. (2010). 'What's A Startup? First Principles'. Available from: https://steveblank.com/2010/01/25/whats-a-startup-first-principles/

Blank, S., Newell, P. (2017). 'What Your Innovation Process Should Look Like'. Available from: https://hbr.org/2017/09/what-your-innovation-process-should-look-like

Blank, S. (2018). 'The Innovation Stack: How to make innovation programs deliver more than coffee cups'. Accessible from: https://steveblank.com/2018/06/05/whats-next-for-getting-stuff-done-in-large-organizations-the-innovation-stack/

Central Statistical Bureau of Latvia. (2018). Available from: https://www.csb.gov.lv/en/statistics

Chesbrough, H. (2003). 'Open Innovation: The New Imperative for Creating and Profiting from Technology'. Harvard Business School Press.

Christensen, C.M. (1997). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business Review Press.

Coley, S. (2009). 'McKinsey Quarterly'. Available from: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/enduring-ideas-the-three-horizons-of-growth

Drucker, P. (1985). 'The Discipline of Innovation', Harvard Business Review, 63(3), pp. 67-72.

Fowler, M, Highsmith, J. (2001). The agile manifesto. Software Development, 9(8), pp. 28–35.

Gothelef, J. (2017). 'Lean Vs. Agile Vs. Design Thinking'. Sense & Respond Press.

Gudd, G., Ozkan, M., Cremer, M., Earnshaw, T. (2017). Venture Development Toolkit. bwcon: Stuttgart.

Harvard University. (2018). Harvard innovation labs website. Available at: https://innovationlabs.harvard.edu/harvard-i-lab/

Imaginatik, MassChallenge. (2016). 'The State of Startup/Corporate Collaboration 2016'. Available from: https://cdn2.hubspot.net/hubfs/1955252/SCC_2016/Startup_Corporate_Collab_2016_Report.pdf

Leankit. (2018). What is Kanban board. Available from: https://leankit.com/learn/kanban/kanban-board/

LIAA. Investment and Development Agency of Latvia. (2018). 'Baltic Startup Mag 2018'. Available from: http://www.liaa.gov.lv/files/liaa/attachments/1-startup-mag-preview.pdf

Maital, S., Seshadri, D.V.R. (2012). Innovation Management: Strategies, Concepts and Tools for Growth and Profit. Sage Response Books: New Delhi; 524 p.

Osterwalder, A., Pigneur, Y. (2010). The Business Model Canvas. John Wiley and Sons: New Jersey.

Osterwalder, A., Pigneur, Y., Bernarda, G., Smith, A. (2014). Value Proposition Design. John Wiley and Sons: New Jersey.

Ries, E. (2008). 'The lean startup'. Available from: http://www.startuplessonslearned.com/2008/09/lean-startup.html

Rivette, K., Kline, D. (1999). Rembrandts in the Attic. Harvard Business School Press.

Royce, W.W. (1970). Managing the development of large software systems. In proceedings of IEEE WESCON, 8, pp. 328–338.

Schumpeter, J. A. (1934). The theory of economic development: An inquiry into profits, capital and credit, interest, and the business cycle. Cambridge, MA: Harvard University Press.

Techopedia. (2018). API. Available from: https://www.techopedia.com/definition/24407/application-programming-interface-api

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