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MASTERING EXECUTION: FOUR GENERATIONS OF THINK.MAKE.START. AT A CORPORATION

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Abstract

Beyond all the tool, methods, and processes, that shall improve innovation in the organization execution is the key. Ambidexter calls for handling daily business with perfection, while simultaneously exploring new topics. However, studies and practice have shown that companies are having a hard time with both at the same time. New approaches are needed to promote the absence of thinking barriers facilitate true innovation. With Think.Make.Start. (TMS) a format was created to empower employees and give them the freedom needed to innovate. The study reflect on four generations of TMS at an OEM.

Keywords: agile, prototyping, makerspace, innovation, multi-/cross-/trans-disciplinary approaches

1. Introduction

In the future, products and services will have shorter life cycles and consumers will be constantly aware of technological advances. The increasing speed of innovation requires the capability to be adept at handling change to continuously generate sustainable competitive advantage. This adaptability does not necessarily apply to the whole system, but to where the speed of innovation exceeds the development time. Agile methods thus focus on adaptability of a system and not on the prediction of specific events (Link, 2014, p. 74). Various aspects of agility are explained by (Förster and Wendler, 2012, p. 14), Tseng and Lin, 2011, p. 3693) and (Sharifi and Zhang, 1999, p. 7). The authors differentiate "agile drivers", that are external factors or changes in the environment that drive the company to a new position in running its business and searching for competitive advantage. In response to this, "agile capabilities" are developed to deal with these drivers. An organization should have such capabilities to be able to respond appropriately to changes in its business environment. New product features are incorporate flexibly and quickly into the ongoing development and to positively response to new user demands.
Start-ups are known for their creativity and agility in developing new solutions. Big corporations, often lack of this agility because of well-established ways of thinking, processes and elaborate coordination. Thus, innovation is most challenging, where it is most disruptive to organizational structures. The top three challenges are: business model innovation, responsibility within the organization, and handling of both, internal and external complexity (Böhmer and Lindemann, 2016, p. 2). To embrace the strengths of agility within a large-scale system, there is not a “one size fits all” solution, but several starting points, such as 100% team allocation. Opening the innovative boundaries of firms leads to innovation dynamics and collaborations with actors outside a given territory allows firms to access needed diversity of resources (Morris et al., 2014 ,p. 271).
To learn from start-ups and bring more agile values and practices into the innovation process, the Makeathon format "Think.Make.Start." has been introduced to a corporation. The aim is to create a free playground to make better use of the employees` innovation potential. Self-organized cross-functional

teams focus on the customer's point of view and validate their prototypes continuously. Participants gain valuable impulses and learn about agile methods that are necessary to become more like a start-up and to do things differently than before.

2. State of the art and research

Innovation processes are characterized by high uncertainty about the problem and the solution space in its early stages (Link and Lewrick, 2014). Prototypes help the development team to improve understanding of the user's issues and possible solution alternatives. At the beginning, very simple, quickly buildable models are sufficient, which then become more complex during development (Smith, 2007, p.101). Prototypes are a central aspect of the agile development of product innovations (Zink et al., 2017).

Prototyping itself is the key activity of product development in the design process (Chua et al., 2010, pp. 5–6; Ulrich and Eppinger, 2016, pp. 296–299). Besides the supportive and propellant role of prototyping in the development of products, researchers like Hartmann (2009, p. 6) and Berglund and Leifer (2013, pp. 2, 5, 12) recognized the cognitive benefits of prototyping reasoning for instance that "*the construction of concrete artifacts – prototyping - can be an important cognitive strategy to successfully reason about a design problem and its solution space*". Houde and Hill (1997, p. 379) argue that, designers make better decisions about different types of prototypes and better use prototypes to think and communicate about design (Böhmer et al., 2017).

With the rise of "FabLabs", "TechShops" and other "Makerspaces", inventors, entrepreneurs and creative people have easy access to high-tech physical workshops to quickly realize product ideas. The term "Maker" describes individuals or groups that create objects as part of a do-it-yourself (DIY) culture. Makers are very involved in building drones, creating low-cost warehouse management robots, and have developed a market-ready, open-source car as part of "Local Motors". What at first sounds like hobby-like tinkering, offers enormous innovation potential in practice (Ramsauer and Friessnig, 2016, p. 44).

The "Maker Movement" is characterized by taking place in a collaborative and flexible environment whose supply doesn't need to be scaled given the existing type of demand (Lang, 2013). The reduction of the costs due to the increased availability of software (e.g. Autodesk tools) and affordable access to computer hardware (e.g. Arduino) have also prompted the higher sophistication of the DIY communities, cultures and projects (Kuznetsov and Paulos, 2010). Co-working spaces provide a work location for young entrepreneurial businesses and freelance workers. Co-working spaces host independent entities, but are arranged to foster synergies between the businesses sharing the common space.

"Makers" are also becoming increasingly important in industry. Company-owned incubators, accelerator programs, innovation rooms, creation centres, FabLabs, co-working spaces or academies are emerging. The increased innovation dynamic requires cooperation with agile partners. Future R&D practices are no longer taking place only internally, but become more open and collaborative. The access to Makerspaces, allows employees to test and implement ideas besides daily business and to communicate across-department silos or -company boundaries. Several examples, such as Microsoft Building 87, Amazon Lab126 or Airbus' ProtoSpace are facilities that provide a special environment and necessary tools to develop disruptive concepts and accelerate the pace of innovation.

The term "Makeathon" describes a Hackathon, that also includes hardware development and differs in terms of participants and prototypes (Zhang, 2012; Briscoe and Mulligan, 2014). Such an event aims to promote interdisciplinary collaboration among employees across the company. Because of time limitation, they are a fast way to explore ideas with high technical and market uncertainties and to decide whether an idea is worth pursuing (Komssi et al. 2014).

Ideally, large companies are both mechanistic and organic, exploiting and exploring. This fact is examined in the literature on organizational ambidexter (Birkinshaw and Gibson, 2004). A distinction is made between a structural and a contextual ambidexter (Engelen et al., 2015, pp. 131-132). For structural ambidexter, exploitation and exploration activities are performed in separate departments or teams. Decision on division between alignment and adjustment are made by top management. For contextual ambidexter, individual employees divide their time between exploitation and exploration. Decisions on alignment between alignment and customization are made by the employees themselves.

However, innovation labs or intrapreneurship programmes often fail to overcome legacy corporate structures, politics, and culture (Owens and Fernandez, 2014). Entrepreneurs need to be in a special environment and isolated from the company to enable the autonomy, incentives, and focus required to innovate (Wördenweber and Weissflog, 2005). "Innovation Cells" are form of organization, that consists of a team of enthusiastic employees who are dedicated, autarkic and who will disband once the project is over. They are particularly good for new projects compromising a certain degree of uncertainty.

3. Think.Make.Start.-Makeathon

Latest research activities transfer agile methods into product development, to enhance interdisciplinary collaboration and to reduce both lead time and development costs. To explore the potential of agility within a mechatronic product development, “Think.Make.Start.” (TMS) is created in March 2015. This 10-day Makeathon ("*making marathon*") provides participants with different backgrounds in engineering or business, for example, the opportunity to develop their products in an agile setting. The iterative development relies on rapid testing, early user feedback, and actual degree of information. Participants benefit from a free prototyping budget, access to our high-tech workshop MakerSpace and the ecosystem of UnternehmerTUM. The Center for Innovation and Business Creation at TUM supports start-ups and established companies when founding businesses. This unique ecosystem makes innovation just happen, for what reason already 11 start-ups (e.g. HawaDawa, KEWAZO, Solos) came out of six batches of TMS at Technical University at Munich.
Since December 2016 the success story of TUM is expanding to the industry sector to facilitate agile transformation in the automotive sector. The Makeathon allows employees to break out of the corporate system and to learn about agile methods hands-on and in a very intense format. Table 1 outlines the time period of four generations of TMS and the correlated number of participants.

Table 1. Overview of TMS-Makeathons participation

Makeathon	Number of Teams	Time Period	Number of Participants	Business Units
TMS #1	5	December 2016	25	4 / 8
TMS #2	10	July 2017	55	5 / 8
TMS #3	15	December 2017	65	8 / 8
TMS Special	5	August 2017	20	3 / 8

3.1. Research methodology

A qualitative research approach is applied as it is rich in a level of detail and enable recognizing nuances (Ingle, 2013, p. 19). It is important to deeply understand the perspective of design and design activities that are associated with agility (e.g. need-finding or prototyping). Qualitative data deliver more information about interactions and situations, which help to understand the context of the projects (Guba and Lincoln, 1994, p. 106; Köppen and Meinel, 2015). For this research, interviews, project reports, and observations represent the qualitative data collection that is used to develop a contextual understanding. Case study design, frequently used in industrial network research, is used to explore the research topic. The approach in this research bases on “systematic combining” grounded in an “abductive” logic, to answer “how” or “why” questions. Case studies are appropriate when researchers have little control over events, and when phenomena are studied within a real-life context (Yin, 2003, p. 1). The flexible research procedure allows to react to unanticipated and emerging events, that is especially beneficial for projects that are studied in an iterative process and are embedded in an ambiguous setting (Simons, 2009, p. 26). The research deals with single case research aiming at theory development from case studies as suggested by Eisenhardt (1989) (Dubois and Gadde, 2002). This type of case study is especially suitable for new topic areas (Eisenhardt, 1989, p. 532; Skogstad and Leifer, 2011; Schmiedgen et al., 2016). The case is evolving during the study and through systematic combination patterns become clearer with every effort (Dubois and Gadde, 2002). However, there will surely be pieces left, which fit other research efforts (Dubois and Gadde, 2002; von Unold, 2017).

3.2. TMS approach

TMS bases on the idea of “agile” being more of a “team’s competence”. It is an applied 5 – 10 days development sprint that unites experts from various disciplines and allows studying mechatronic development in an agile setting. The Makeathon provides a free playground to deal with (un)expected changes and to apply inputs about prototyping practices, as well as business and engineering methods. The core element of TMS is the collective feedback at the daily progress presentations. Using TAF Agile Framework each team reflects on the progress made and plans the next steps (see Hofstetter et al., 2017). The emergent character of this iterative learning facilitates a reduction in uncertainty with minimum time and resources. TMS fosters flexible use of technologies, modified management processes (e.g. decision making), leverages systems design and bases on a high number of prototypes (for user testing, increase in knowledge and system integration aspects). The approach ultimately results in a result-driven continuous adaption to the current situation. The Makeathon concludes with a 3-min-pitch and a demo of the working prototype.

3.3. TMS at a corporation

TMS was initiated bottom-up, combining several "unfair advantages" of the corporate. Competitive advantages are resources a corporation can use to succeed against start-ups. A start-up usually has less capital, fewer experts, less brand presence, and incomplete business processes (Freeman and Engel, 2007, p. 94). The format benefits from the partnership of a makerspace and the OEM. The high-tech workshop is accessible to all OEM employees as an innovation incubator, enabling them to respond to new ideas and test them directly in an accelerated process, without lengthy processes and procedures. In addition, the company offers its employees the opportunity to use the premises and machines of the Makerspace for private projects.

Think.Make.Start. brings together eager employees from the complete company, willing to “just go for” an idea. The Makeathon allows to leave daily business alone and to focus on their ideas for at least 5 days in a role. The 100% allocation of the team members facilitate efficient work and instant agreements, without interruption. The creative environment facilitates a new mode of operation, far away from day-to-day distraction. Employees learn to work in a cross-functional team and are confronted with early user testing.

Experienced "Maker Experts" join the Makeathon to help the innovation teams in terms of prototyping practices. A free budget facilitates an unbureaucratic purchase of small electronics or materials, without the necessity to start an ordering process. Teams work fully autonomous and implement their ideas as autarkic as possible. Prototyping activities help to learn about the problem and to improve the idea or rather the implementation thereof. Employees develop their concepts iteratively while balancing between trial-and-error methods and systematic thinking. The Makeathon attracts people with practical skills, but also hidden champions with a high level of expertise and experience. The format allows to collaborate across silos and work together on a common vision independent on individual goals.

An innovation object helps to get a holistic view on the integration and to test the prototypes as early as possible with the potential user. In contrast to start-ups, a corporate already has a business model and a customer base. To leave the usual path it is recommend building upon existing strength and company resources. A car serves as a fix point and maximising the employee's strengths improves the intercultural performance and behaviour. The empowerment of the teams affects all participants and triggers a cultural change from delegation towards DIY.

The Makeathon takes place twice a year and calls for employees from the whole company. The aim is to bring talents and motivated people together, independent from their current job position or affiliation. The focus is on interdisciplinary skills and expertise to form cross-functional team that is able to implement the product ideas. Candidates apply with an idea, but get selected by background and skill-set. Each TMS batch is representing a perfect blend of competence variety and people diversity found in the corporate. The focus of the Makeathon is to share knowledge and experiences. Teams compete, but also share their experience with all participants.

The overall topic for TMS is aligned with the emerging trends such as: Digitalization, Individualization, and Urbanization. For more specific topic a variant of Think.Make.Start. was created: TMS Special. An

experienced development team working on a certain topic is enhanced by young talents, currently employed at the company (e.g. working student).

3.3.1. Objective

An agile group benefits from its learning organization that has the capability to be responsive and adaptive to changes. Instead of cultivating knowledge silos, employees collaborate in innovation cells, that prototype to learn and to acquire user feedback. Intrapreneurs help to absorb the innovation culture and apply those learnings back into day-to-day jobs. Side effects are better networking ("knowledge exchange"), high collaboration ("user-cantered / entrepreneurial"), and self-organization of several key stakeholders ("collective intelligence").

The aim of TMS at a corporate is to derive management strategies to integrate agile methods into the innovation process of complex mechatronics to increase the innovation capability. The research seeks for a "free playground" for visionary employees to make use of the corporate complementary assets to compete with agile start-ups. Makeathons foster cross-linking to internal stakeholders and improved exchange of knowledge. They interconnect experienced employees with specific expertise and provides access to the network and resources of the corporate. Agile teams are a combination of technical and entrepreneurial know-how with speed and flexibility of start-ups. The cost-intensive and assumption-based product development is shortened iteratively while isolating uncertainty. Innovations are evaluated with the user quickly by hypothesis-driven experimentation, iterative prototyping, and validated learning.

Existing innovation management is enriched by establishing an entrepreneurial short-sight in addition to accurate long-term prediction for innovation projects. Blöchl (2013, p. 81) emphasizes that companies can benefit from a balance of traditional and agile approaches. It is important to find a suitable compromise between agility and risk. If there is too much anticipation, there is a lower risk, but at the expense of a later market launch. In case of inaccurate planning an earlier market introduction is possible, but the risk is extremely high.

3.3.2. Agenda

The goal of the 5-day workshop is to have a validated Problem-Solution-Fit, that has been implemented and tested with the user. Participating teams are given the necessary freedom to pursue their ideas in keeping up with the motto "fail fast, cheap, and early". Each Makeathon has a mentor, who acts as internal promoter for the initiative and guarantees the teams executive support. The format fosters horizontal alignment across silos to work together on a common vision with a positive mind-set.

The teams work in a project room, at the Makerspace, where they have access to an innovation object (e.g. vehicle) to rapidly test their prototypes. TMS features free prototyping budget that facilitates an unbureaucratic purchase of small electronics or materials, without the necessity of an ordering process. The technology library compromises rapid prototyping systems (e.g. Arduino®) to accelerate the first prototyping phases. Experienced "Maker Experts" join the Makeathon to help the innovation teams with best practices and the use of the machines.

The agenda of Think.Make.Start. at a corporate is adapted to a shorter time frame and with focus on project continuation subsequent to the Makeathon itself (see Böhmer et al., 2016). A reconciliation with past innovation projects and an expert assessment helps to manage the novelty of the project ideas. For more focused topics, the Makeathon was adapted in terms of participants, and agenda ("TMS Special"). Experienced team member guide unbiased talents and provide valuable suggestions to structure the solution process.

From day one, the user is in focus and prototyping activities help to learn about the problem and to improve the idea and the implementation thereof. Employees develop their concepts iteratively following TAF Agile Framework. Agile coaches support the teams with best practices from previous Makeathons and help the team from a holistic view to focus on the most important task. Early user tests push quality-conscious employees out of their comfort zone while keeping up with the motto "if you are not ashamed of your first prototype, you`ve waited too long". Each team passes the Makeathon with a pitch of the working prototype to top management and a public audience. The continuation of the projects is facilitated by corporate incubation or acceleration programs. The winner ceremony rewards the teams for their non-stop effort and triggers networking.

3.4. Reflection on approach and outcome

The 5-day workshop qualifies employees to work intendedly and strengthen the communication within the teams. TMS allows the teams to reflect on agile values: commitment, courage, focus, openness and respect. On the downside, the absence of team member, for example, may cause self-consciousness and frustration. Insufficient communication also results in misinterpretation that knock the team off course. The creative atmosphere of Makerspace enriching and facilitates a new mode of operation, far away from day-to-day distraction; "*We have looked outside the box and have been able to network across divisions in the company*". The intense format fosters cultural change and a small group of "naysayers" transforms towards adventurous innovators: "*positive mood of [everybody] involved". Participants appreciated the "opportunity to network*" and the "*support without interference and the [limited number of] rules*".
However, groups tend to lose themselves in a "can we really realize this" mentality, which does not help to get things done. A see-feel-change is far more likely to precipitate change than is analysis-think-change. However, it was shown, that the number of "naysayers" within a team must be less than two persons (for a team of min. 5 people), as the communication effort increases extraordinary. The free-playground is framed by a minimal budget, limited time, and do-it-yourself activities. There is no strict process the teams follow, but employees decide for themselves in the given setting. The pace is kept with the daily progress presentation. Participants "*experienced motivation by loyalty*".
Despite the time pressure and trial-and-error experiences, the teams experience "*creativity, a great teamwork (...) and a great team feeling on the output*" that has been "*achieved in such a short time*". Teams enjoyed the energy and professionality "*and the overall passion for the projects*". Although the teams are competing, they helped each other and compensated missing skills. The innovation object was very valuable as it allows to "*just get started on a real platform*". Teams stated that they felt like "*working like a start-up" or at least in a "start-up atmosphere*".
User feedback "*in early stages is helpful even if the prototype is not yet as ready as*" the team "*wish it to be*". A successful collaboration is also about "finding the right tasks for everyone to get involved". The limited time and resource forces a team to get "*into a new topic as fast as possible to get a deep dive to be able to have a prototype within as less time as possible*".
The insights gained are very valuable and within the interdisciplinary team, team members learn "*how other people approach such problems*". The biggest takeaway from the Makeathon are to "*be unshackled from thought patterns and being able to make one's ideas come true in a physical form in an insane speed*". The co-location of the team promoted fast decision-making which was very much appreciated by the teams. Participants also stated, that they learned to "*be agile*" while experiencing a "*shift in mindset*". Several employees were amazed by the "*work progress" they can achieve, when focusing "on one thing*" (vs. multi-project management). However, the teams also stated, that "*agile mentality is not for everybody*" and implies a huge cultural shift when expanding to the entire group.
Each project idea was significantly improved by customer feedback. The teams fully understood the user`s context and how the user is using the prototype. The "error-culture" at TMS also promotes a shift in mind-set. "(…) *We discovered that, thanks to new methodology, it is possible to develop quick solutions. At the same time, failure is allowed, which can be a way to a better solution*." The outcome of the Makeathons are not necessarily "new" ideas, but an elaborated concept and a working prototype; one participant stated the key take-away as follows: "*quick decisions and consistent implementation, target-oriented development to the needs of the customer, continuous questioning of requirements and alignment with customer needs, (...) prototypes on a small budget, [and] creativity in general*". The number of patents related to the Makeathon increased significantly.

3.5. Discussion and implications

Four Think.Make.Start. took place between December 2016 and December 2017. The Makeathons attracted 165 employees from every business area. Each TMS batch represents a perfect blend of competence variety and people diversity found in the corporate. The skill-set ranged from electric and electronics, to programming, mechanical engineering, or business, for example. The participation also included international guest, taking the innovation on a global scale. *"An ingenious way to gain insights into other business areas. This is about designing and producing something together. For me, attending was a very rewarding experience."*

The Makeathon promotes "do-it-yourself" activities, that are indispensable for agile mode of operation. The format gives employees the opportunity to unite existing competences in-house or to build them up on own strength. The reduction in the ratio of external services to own contribution serves as a preparation for digital future. The successful development of an idea depends on the ability of the team. The prototype result is highly dependent on the skill-set of the cross-functional teams that fosters one common vision. Knowledge transfer across departments is facilitated by the co-location of the team. Maker experts that are very experienced in prototyping support the teams and increase the quality of prototypes.
Think.Make.Start. enables the teams to work autonomous on their product vision in absence of traditional decision-making processes. The team allocation promotes the focus on one single project with no day-to-day distractions. Teams are accompanied by experienced coaches, who help to hold on to the rules and to focus on the most critical or rather important step to do. The format depends on strict time-boxing, as there is no time or resource for non-value adding activities.
Rapid Prototyping is enabled by access to makerspace and a small but free to use budget. Agile means nimble and refers to reacting quickly to changing conditions. Rapid prototyping facilitates learning from short trial-and-error prototyping cycles. With each prototype, the development process is flexible and accelerated. The team spends limited time on documenting, but focuses more on the evolution of the product properties. The development focuses more on the goals to be achieved and addresses technical and social development issues. Instead of the fixed sequence "specification, construction and implementation", the project is carried out in very close and direct cooperation with the client. The specification is made successively during the implementation.
Early user interaction with a prototype ultimately maximizes the value of the system. Customer satisfaction is the most important measure for successful design. During a development project, requirements and boundary conditions change, and the understanding of the problem is deepened. Continuous user feedback facilitates a value-driven process while constantly forcing the team to reflect and challenge the current state of the product. The customer gets what he needs, not what he has specified. This is an important advantage for projects whose requirements are still unclear at the start of the project or which are subject to changes due to external influences. Only when a customer has seen and used the product once, he is able to formulate explicitly what the system should look like in detail.

4. How to bring it home?

When comparing the innovation projects at TMS with traditional innovation process, the effort in time and resources is reduced to ~2,22% in time and ~0,8% in budget. The focus on early evaluation of ideas helps to focus on value adding activities and improves the product idea. The co-located interdisciplinary team allowed a comprehensive view on the project and conflicts are tackled early in the project. TMS is not about more innovative ideas, but on interdisciplinary and user-centred innovation. Heterogenous teams came up with better results, as they incorporated different aspects. The format promotes low cost solutions that have a great focus on user value. Rapid prototyping activities accelerated the innovation process and allows continuous learning.
Main challenge of TMS teams are the continuation of the project or rather "how to bring it home". Innovations across departments are most challenging to continue, as these projects often lack a product or functional owner. Because of the existing organizational structure, taking on responsibility for further development is accompanied by great effort in communication and coordination.
Innovation teams struggle to achieve their objective, and much of their time and effort is spent gaining legitimacy and power within their own organization. Teams often lack the right connections to bring the solutions to the core business. They must overcome organizational barriers (e.g. process, timeline, meetings) and find a critical path through the organization to bring their idea to market. Driving innovation in a corporation can be as exhausting as working in a start-up.

4.1. From "Start-up Agility" and "Corporate Quality"

The early phase of an agile project is characterized by full protection from existing management objectives. The team is given autonomy, incentives, and focus required to innovate. The tolerance for

failures promotes the willingness to change and may ultimately go beyond the company`s boundaries. The predominant values for an agile team are transparency and continuous improvement. Temporary agile teams are dismissed from their daily business for a specific time frame to develop the project idea further and to promote it towards series development. With project progress, the level for agility is reducing continuously and shifts towards a traditional approach. Experts are brought in on an as-needed on a temporary basis to help the agile team to overcome difficulties and to transfer their skills to the team. With increasing product specification, the agile teams are dissolved and experts take over (see Figure 1).

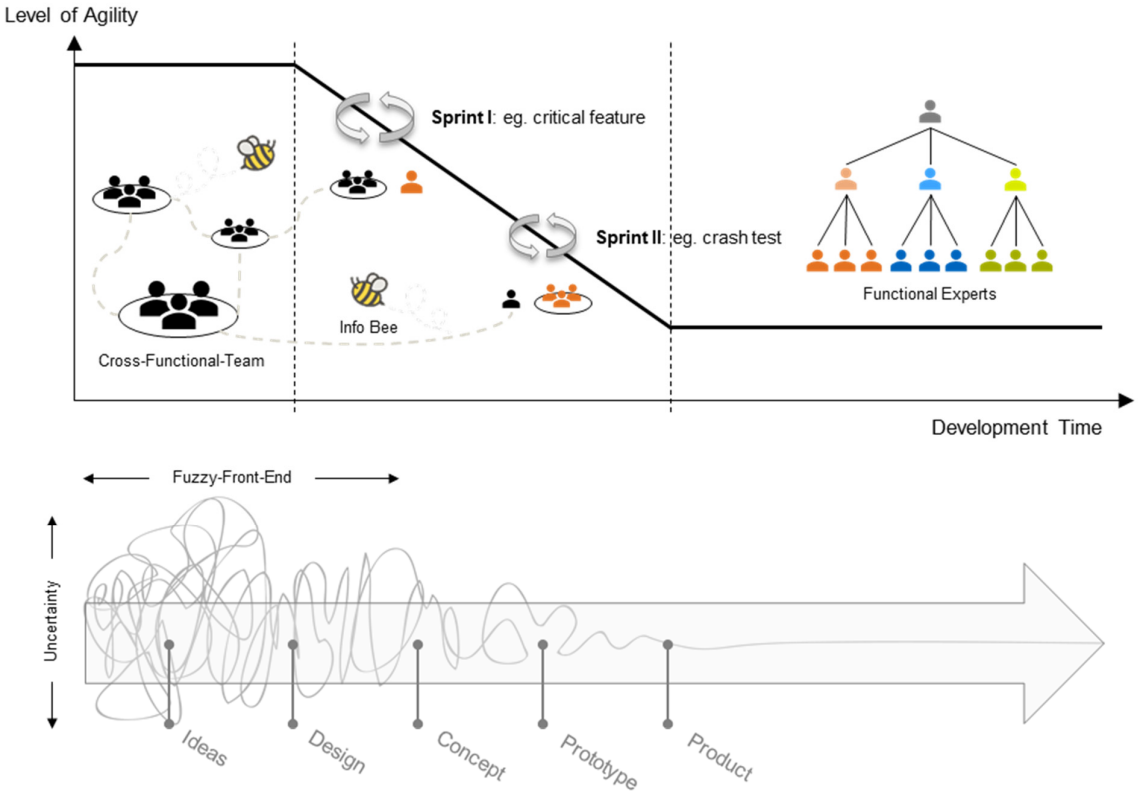

Figure 1. Integration strategy "from agile to traditional"; with progress of the project, uncertainty ↓ and knowledge / experience ↑

To guide innovation teams efficiently, "information bees" connect relevant projects, ensure knowledge transfer and stay on top of things. Manager protect the innovation teams from daily business and conflicting goals. Necessary resources are acquired with minimum time and effort to deliver value to the customer. Early pilot studies facilitate a user-centred development and hinder cost-down activities or over-engineering practices. With increasing maturity, the project becomes ready to scale and relevant experts are involved early on. A stakeholder analysis identifies relevant player to get them involved appropriately (e.g. active, semi-active, consulting, passive, …). The transfer from the initial innovation team towards the series development is facilitated by minimum testable products, that are evaluated in private or semi-public setting. A successful testing triggers a minimum viable product that is launched within a certain market.

In the long-run, a temporary allocation of development teams is more efficient than standard innovation management. The clear separation between innovation projects and daily business helps to explore new ideas and exploit established competencies, resulting in an efficient resource management. The transition from plan-driven towards result-driven projects fosters close collaboration of the development teams. The innovation management shifts from controlling towards enabling. The maturity of projects is not measured with regards to stage-gate-models, but based on user value. Time-consuming front-

loading and high cost of late changes are substituted by sprint-workshops and cost of prototype. Early networking helps the departments with their own planning and different types of prototypes facilitate early testing and learning.

4.2. Corporate Canvas to guide innovation teams

An idea combined with successful execution can change the world. For employees within large corporations the path on how to execute is often unclear. For projects, that are new to the company, a new path must be found beyond existing structures, processes and mind-sets. The "Corporate Canvas" (CC) is a strategic management and lean start-up template for developing new products within the framework of an existing business. It is a visual chart with elements describing a product`s unique value proposition, infrastructure, stakeholders, and decision-making. The "Corporate Canvas" is inspired by "Lean Canvas", "Business Model Canvas" and "Product Vision Canvas". It assists intrapreneurial teams within a corporate to aligning their activities with the core business by illustrating potential trade-offs. Intrapreneurs make use of internal expertise and resources in terms of unfair advantage to create a "Minimum Viable Product" (MVP). This new product is created independently from existing processes and decision-making to reduce time-to-market, but designed for rapid scaling within the corporate framework.

The template is structured into 10 segments, that can be clustered into 3 key areas a intrapreneurial start-up must focus on (see Figure 2). First, the team identifies a problem-solution-fit what the corporate has in terms of unfair advantages to offer a unique added value to a user problem (1 – 4). Second, a MVP is built iteratively through prototyping and learning while testing critical hypotheses in order to reduce uncertainty for this product idea, that is new to the company (5). These prototyping activities are aligned with internal activities and necessary deliverables to facilitate early involvement of both valuable stakeholders and resources (5). Third, a critical path is identified, by circumventing internal Show Stopper, using key stakeholders and strategically make use of decision-making processes top to allow a successful market entry and rapid scaling of the preciously developed MVP. Main challenge of agile teams within a corporate framework is to balance the internal and external perspective.

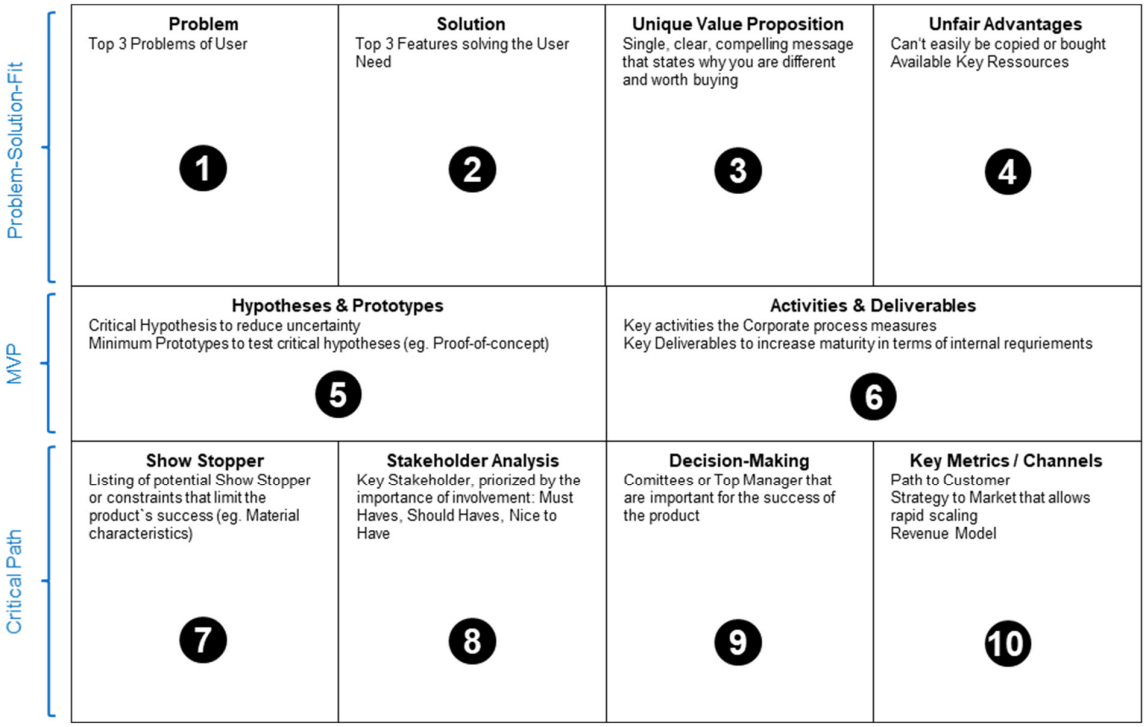

Figure 2. Corporate Canvas

5. Conclusion and outlook

Hackathons are emerging in innovation practice, however, only a few industrial examples exist. Especially for hardware related projects there are only a few publications. As with Jensen (2017), it is challenging for industry to identify, which applications of makerspaces and prototyping tools best fit in a corporate context. This paper introduces a first evaluation study of the Think.Make.Start.-Makeathon at a corporation. A first attempt to systematically facilitate the continuation after TMS is presented in terms of a Corporate Canvas. Collaborative initiatives are triggered by an increasing innovation dynamic, shortened development and product life cycles and the aftermaths of the information and knowledge society (Böhmer et al., 2016). On this account, Makeathons are a huge opportunity for large companies to overcome rigid structures and to implement new ideas more quickly. Collaborative initiatives allow employees to easily network and communicate across organizational borders. In contrast to intrapreneurship programmes, it has been shown, that a Makeathon overcomes legacy corporate structures, politics, and culture. A Makeathon represents a "free playground" for strategic decision-makers and creative thinkers and supports the formation of subject specific alliances.

To permanently push the boundaries of a corporate in innovation management, an "Agile Innovation Strategy" is needed. Established mechatronic development processes cannot be adapted to agile in the short run. It involves co-engineering of different disciplines, which require a high level of integration. Cross-functional teams (CFT) are put together bottom-up or top-down, recurrently in contact with core managers, using the companies' resources, and delivering value to the user early and continuously. Internal contradictions are solved by taking inspiration from start-up strategies, embracing open innovation, less hierarchical management and integration of entrepreneurial behaviours. As a starting point Think.Make.Start. is implemented, establishing an entrepreneurial short-sight in addition to accurate long-term prediction for innovation projects.

Main limitation of this paper is the small sample of analysis. Future steps involve a deeper understanding of the specific goals, approaches, and interconnections of each stakeholder. Furthermore, the relevance of Makeathons will be explored considering agile transformation. Besides this, the impact of IP rights and the accruing innovation culture will be examined. The lasting ambidexterity of "Start-up Agility" and "Corporate Quality" may be boosted by a special programme after TMS. Temporary CFT are protected from existing management objectives, and are given autonomy, incentives, and focus required to innovate. Such a program increases the tolerance to failure, promotes the willing to change and may ultimately transform the organization into an agile innovation system, that may go beyond the company`s boundaries.

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