“From Problem to Prototype, together!” – Incubation and Co-Creation for Digitalization Demands and early-stage IT-Innovations

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Abstract

This chapter looks at Siemens Healthineers' OpenIT Studio approach, which is used within the company to co-creatively catalyse IT digitalisation requirements at an early stage with a fuzzy, exploratory nature. Based on an in-depth case study, we describe our methodological approach to ensure user-centricity by leveraging design thinking and our core toolset of low-code technologies to enable rapid prototyping iterations with tangible results. The chapter presents a concrete use case and the resulting artefact in terms of a virtual cybersecurity escape room to outline the context and approach. Taking into account a significant number of use cases that have been completed and evaluated in terms of user satisfaction and recommendation scores, the paper concludes by highlighting three key groups that benefit from such incubation of digitalization demands, namely businesses, all Healthineers, and IT.

Objectives and goals: Fostering Co-creation, user-centricity, skills for citizen developers and business partners, interactive needs assessment and realisation of digitalisation demands.

Materials and methods: Over 100 facilitation modules and templates for virtual and in person design sprints, creativity, and engagement methods, KPIS, suitability and success factors, tools for prototypical implementation of digitalisation IT demands.

Results: Sharpened Business and IT Digitalization Demands as well as Sprint Challenges, Creative out-of-the-box Idea generations, Co-created Software Prototypes, Tested and Validated User Feedback.

Keywords: Co-Creation, Design Thinking, Information Technology, Lowcode, Open Innovation, Prototyping.

Introduction

Today’s business environment is characterised by the term “VUCA”, which refers to increased volatility, uncertainty, complexity, and ambiguity [1]. While the average lifespan of an S&P 500 company in the 1950s was 60 years, by 2015 it had shrunk to just 15 years [2]. This huge effect across all sectors is likely to continue or even intensify, fuelled by disruptive macro factors such as the pandemic. More flexible and location-independent digital ways of working have also been adopted on a larger scale during the pandemic. Digitalisation was already an important trend before, but it has recently accelerated significantly [3].

The purpose of Siemens Healthineers is: “We pioneer breakthroughs in healthcare. For everyone. Everywhere. Sustainably.” This requires strong capabilities in the areas of patient twinning, precision therapy as well as digital, data and AI [4]. Within Siemens Healthineers, the goal and mission of Information Technology (IT) is to “digitalise the core”. This refers in particular to the digitalisation of enterprise processes and working methods, which is also reflected in the four Hoshin Kanri breakthrough fields (cp.[5]) of IT:

1) Digitalisation of processes and services: IT is the proven partner, innovator and pioneer for Healthineers’ digitally enabled end-to-end services, to open up new growth markets and to leverage and explore new business models.
2) Innovation for users: Every Healthineers is fully engaged with an innovative, secure, and user-friendly digital working environment. Overall, seamless, and fast access to information is made possible from anywhere.
3) Cybersecurity: Cybersecurity in the IT landscape is based on adequate and adaptable protective measures (technology and knowledge) that build trust and ensure the continuity of business operations as well as compliance with laws and regulations.

4) Digital transformation of IT: Transformation into an integrated, business-oriented IT organisation with all the necessary skills, competencies, and capabilities to drive digitalisation as the benchmark IT organisation in the industry.

Enabling new ways of working also refers to the exploration and implementation of digitalisation needs that arise in the business, in an interactive and fast way. Two main forces – demand pull and technology push [6] – offer IT a field of opportunity and action that often requires exploration rather than straightforward implementation. An approach based on open innovation [7] has been developed specifically for fuzzy requirements, where a clear problem definition and creative ideation can address challenges that are carried out in rapid iterations with tangible, testable prototyping results to narrow the solution space.

As shown in Figure 1, we apply a co-creative approach along these phases, involving a small group of essential core roles – such as the business colleague/ambassador (who brings the challenge and has expertise in the relevant business domain), the facilitator (who methodically guides the group through the sprint), the techie(s) (who creatively and concretely explores potential technical tangible solutions) and the business partner/IT guide (who has an ongoing relationship with the relevant business unit/function and is familiar with the relevant system interfaces) – and connects to further IT experts as needed, depending on the specific challenge.

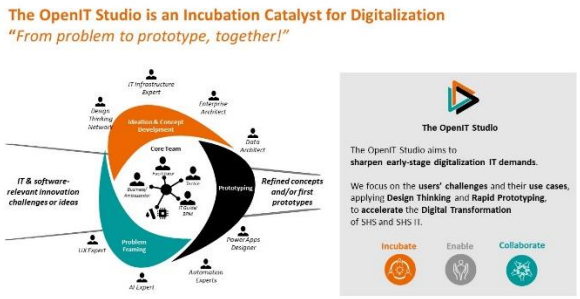

Figure 1: OpenIT Studio Approach

In this way, we can draw on different perspectives and expertise, with a rigorous focus on the business challenges at hand.

Materials and methods

To progress and succeed on the path of digital transformation, one needs to consider two essential aspects.
Firstly, the human dimension: Since people control the processes in organizations and make business-critical decisions, it is obvious that the methods must be geared towards people in terms of user orientation so that they can derive the greatest effectiveness and efficiency from technological advances (cp. [8]). In addition, empowering people in terms of their skills and competences is crucial for the successful use of new tools (cp.[9]). The aspect of enabling behavioural change and change management [10] also comes into play here when it comes to the adoption of new tools and processes resulting from the transformation. Secondly, the technological dimension of new tools and enablers is an intrinsic part of digitalisation. Given the unprecedented speed at which new tools and functionalities are becoming available, screening, integrating, adapting, and managing them remains a critical piece of the puzzle (cp.[9]). Beyond the individual tools, the entire enterprise architecture and interfaces must be considered in a sense that goes beyond the individual tools and ensures consistency, standardization, and smooth operations.

Innovation Think Tank Methodology

There is a growing need for self-sustaining innovation infrastructures among healthcare providers and medical device manufacturers to fulfil their customer-oriented requirements. The global ITT infrastructure with its portfolio provides opportunities for healthcare system stakeholders to engage in a sustainable way. The ITT methodology is independent of the type of project and can be applied across innovation lifecycles and industries.

The ITT methodology is presented into four steps: Acquire Mandate, Big picture creation, Co-creation on decision propositions and Deploy commercialization [Figure 2]. The definition of the ITT methodology steps was created based on 1) the importance of the project stages with respect to the KPIs including revenue potential and saving etc. and 2) the simplification of process to ensure tangibility for the users.

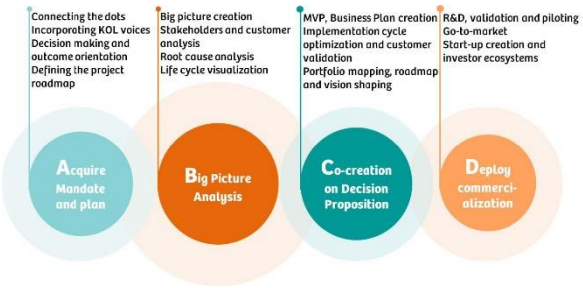

Figure 2. The Innovation Think Tank Methodology

As in the global ITT prototyping framework (cp. [11]), it is important to create, test and validate IT prototypes quickly in order to incorporate valuable user feedback for adjustments.

Real-time customer feedback plays an important and impeccable role in extracting key insights from various healthcare stakeholders. This helps in obtaining accurate key components/requirements for product definitions, product enhancements and need-based working mandate. An Innovation Think Tank Prototyping Framework [Figure 3] (ITT PF) was developed by analysing various past projects and 17+ years of customer interaction based experiential learning. ITT PF consists of various intrinsic elements from the global ITT infrastructure. ITT PF has two working modules, one module at various ITT customer sites across the globe and another module at ITT site with trans-disciplinary teams. At ITT customer sites around the world, ITT teams extract key technology trends from the market, update their knowledge about clinical pathways and practices, identify pain points for product requirements, and validate new products at customer sites.

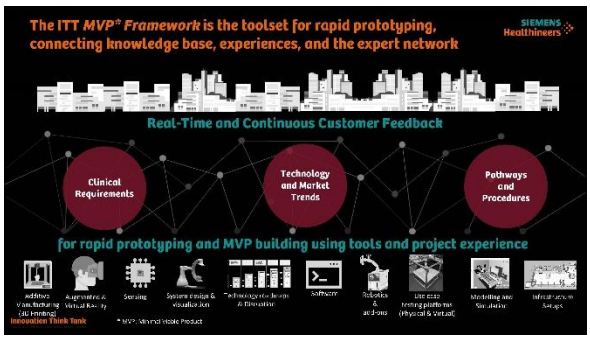

Figure 3: Innovation Think Tank Prototyping Framework for creation, testing, and validating MVPs in a customer environment equipped real-time customer feedback and ITT tools.

Against the background of the slightly different nature of IT prototypes vs. modality or pathway ones, the OpenIT Studio approach aims to combine both aspects into challenge-driven, business and IT co-creative design sprints. Here, we leverage design thinking as human-centred method and lowcode standard platforms that enable rapid prototyping, automation, display, visualisation, and other functionalities.

Design Thinking

Exploring the human aspects that foster innovation and transformation requires a method that captures the essence of the human experience. One must consider a broad spectrum of human virtues, such as intuitive thinking, emotional exchange, and a flexible approach to collaboration. Design Thinking (DT) is a hypothesis-driven methodology that focuses on problems and solutions. For us in IT, it is well suited to contexts where uncertainty and ambiguity are high. It consists of empathy, problem definition, co-creation and collaboration, visualisation and prototyping, and iteration [12]. The methodology provides a dynamic framework to build on human-centred approaches and creative flow, embedded in learning-by-doing, iteration and the ability to generate ideas for relevant user experiences. The use of design thinking in an organisation triggers an experimental learning process that supports the development of user-centric cultures [13]. In addition, Design Thinking as a method and practice at an organizational level reduces cognitive biases, builds creative trust between teams, and delivers greater value over time. In this context, the Design Value Index shows that the returns of design-led companies are up to 219% higher than those of standard S&P 500 companies over a 10-year period [14].

Figure 4: Design Thinking Principles

Design Thinking applies a human-centred way of thinking based on the basic principles shown in Figure 4. As a user-centred approach, the practise of empathy is linked to the entire process to ensure that users' pains, joys and even frustrations are adequately captured. With its iterative methodology, DT encourages learning from mistakes throughout the process. As the methodology tackles a business challenge with hypotheses and goes further into detail with DT, the errors tend to be recognised more quickly and the overall risk is reduced [15]. This goes hand in hand with the culture of ambiguity throughout the process, as identifying the uncertain areas creates greater awareness and helps to reduce comprehensive risks.

Building such a culture of exploration ensures an empathetic way of working for both users and teams, as it opens doors to creative ways of identifying problems and solutions. To accelerate hands-on work, visualisations in the form of drawings, maps, notes, and emotional journeys strengthen collaboration and provide greater transparency. This is further amplified by divergent and convergent thinking. These two forms encourage outward and inward thinking when it comes to framing a problem and finding a solution. A divergent approach

encourages exploring different aspects, problems, and solutions to the user challenge, while convergent thinking involves prioritising specific problems or areas so that there is a structural progression in the approach. In DT, this approach is quickly applied to prioritise and balance analytical and creative thinking methods.

The application and working methodology of design thinking is explained using the visual representation of a double diamond, as shown in Figure 5. One diamond represents the problem space and the other the solution space. The purpose of the "diamond" is divergent-convergent thinking, which essentially supports teams to think creatively and in a defined context throughout the process, as explained earlier.

Figure 5: Design Thinking Process

The purpose of the *problem space* is defining objectively and empathetically the user's challenges in a precise and visible way. This includes:

Understand – In this phase an innovation team outlines the context of the challenge. Here, tools such as context mapping and jobs-to-be-done, stakeholder mapping, interviews, persons etc. help define the scope of the challenge as well as the key pain points for the user(s).
Observe – Here we look at the pain points, needs and expectations users express about the challenges with an initial analysis. This is supported by interactions with stakeholders and a comprehensive understanding of the current state. The creation of initial journey maps, refined empathy maps and visual diaries to support user interviews strengthen the empathetic user perspective.

Define – While the previous phases diverge to explore a user-specific overview, the 'Define' phase summarises and defines the problem to be solved in a clear and simple statement. This is known as a 'How might we statement' (HMW), which captures a specific pain point of the user with a clear objective to solve the problem. This not only ensures clarity in the DT process, but also helps prioritise the problems that users need to focus on, one at a time.

Moving into the *solution space*, the key focus lies on creating and testing potential solutions:

Ideate – In this phase, divergently urges the team to seek as many creative solutions using methods like crazy 8's, 6 thinking hats, brain walking etc. are used to encourage quantity of ideas over the quality. This focus helps to keep the solution space wide and reduce bias. These ideas are further analysed for feasibility and impact value to move to the next phase.

Prototype – This is where an early model of a potential solution is created. However, the focus is on creating a tangible result that can be discussed with the user to get their feedback early on. In this scenario, tools such as LEGO models, cardboard and paper prototypes, mock-ups, etc. are used to achieve a higher level of user engagement and tangibility.

Test - In this phase, the defined problem is presented to the users together with the prototype to test the resonance of the pain and potential solution. This is critical to ensure hands-on feedback from users that provides as much clarity as possible on the results.

The phases and sequence of their occurrence is not a linear process. Depending on the context, one is encouraged to go back one or two phases if they do not match the user perspective. Therefore, the DT process is considered flexible and iterative, which drives the working methods and overall success of the organization with a close people-centric approach.

Lowcode Technologies

Lowcode tools have emerged as powerful solutions for speeding prototype development, thereby fostering innovation within the realm of software development. These platforms are characterized by their support of rapid development while minimizing the need for traditional code-writing skills. They are characterized by intuitive drag-and-drop functions and a repository with ready-made components (cp. [16], [17]).

One of the main advantages of these tools in the IT innovation landscape is their speed in developing tangible artefacts [18]. This empowers users to quickly see and evaluate their concepts in a clickable prototype and thus iterating prototypes in shorter cycles. Especially in the context of OpenIT Studio, this visual approach has proven to be helpful in improving the understanding of ideas and promoting further development cycles. Furthermore, due to the

accessibility and user-friendliness of use of these tools, only minimal programming skills are required to develop new solutions [18]. This democratizes the development of tools and allows people without formal programming knowledge to develop and maintain their own tools.
Finally, the inherent flexibility of these tools is a pivotal attribute that allows developers to create different types of applications or add additional modules to existing applications [19]. This adaptability proves to be essential in the highly dynamic and changing innovation environment, both in the initial creation phase and in the maintenance and customization of the solutions created.

Several low-code platforms have been strategically selected within Siemens Healthineers. The targeted use of individual platforms enables Siemens Healthineers employees not only to train and build up skills on the respective platforms, but also to offer specific support within the various tools as well as suitable licenses and development environments.
The low-code tools from Microsoft's Power Platform, consisting of MS Power Apps, MS Power BI and Power Automate, are used in particular. They integrate seamlessly into the existing Office 365 ecosystem (cp. [20]). In addition, Qlick Sense and Tableau are used for visualization or UI Path and Snowflake e.g., for automation and data integration.
Overall, the main reasons for using low-code tools as part of the OpenIT Studio approach are their rapid availability, user-friendliness, development speed, available and trainable competencies, and security, as they are part of our IT platform and IT infrastructure portfolio.

Results

The OpenIT Studio approach encompasses a framework of methods, techniques, technologies, skills, and capabilities. This combination makes it possible to structure highly customized requirements and contexts into co-creative design sprints, to leverage the described set and to improve it over time by building up experience.
Figure 6 shows an example and completed sprint template on a virtual whiteboard, a tool we use for creative global collaboration between sprint teams. Compared to physical stickies, it allows even more consistency, the integration of different file formats, shapes, and better readability.

Figure 6: Exemplary Design Sprint results, documented on a Virtual Whiteboard

In the following, we will describe an exemplary use case in more detail to promote understanding and outline the entire OpenIT Design Sprint approach, its phases, the selected methods as well as its tangible results in an experiential way.
With the spread of the pandemic at the beginning of 2020, all possible work was moved remotely. This not only disrupted office and personal interactions for teams and employees, but also increased the potential attack surface for cybersecurity threads through increased exhibition [21].
With this in mind, we formulated and overcame a challenge for the design sprint together with our colleagues from the cyber security department. In the initial Problem Framing phase (cp. Figure 1), we extracted that most of the potential security issues and mistakes respectively are rooted in human behaviour – clicking on an unknown link, plugging in a found USB stick, weak passwords, etc. To improve human behaviour and foster risk management, crucial aspects are awareness and positive group dynamics.
It became evident that there should be almost no additional limits on access to the resulting artefact in order to enable low barriers to entry. This resulted in the following HMW question, which outlines the plot, theme and intended outcome, but does not yet limit the creative space to a specific solution: *"How can we raise cybersecurity awareness for our remotely connected Healthineers, in a simple and enjoyable way, leveraging our standard IT infrastructure?"*
This common goal already pointed to an interactive, collaborative, and fun learning experience on cybersecurity.

In the next phase of Ideation (cp. Figure 1), the cross-functional team generated the idea to build a virtual cybersecurity escape room, leveraging gamification elements and allowing for a group fun experience, that could even encourage follow-up conversations and discussions. From this, we derived the following epics in an agile approach, which we wanted to continue working on (cp. [22]):

1) *Quests and riddles* (the individual pieces of the puzzle that the group must solve);
2) *The overall scenario* (which must link the aforementioned pieces together and offer the group an engaging challenge to solve);
3) An appealing *look and feel* (of the individual rooms and scenarios);
4) *A briefing and debriefing concept* (in which the group receives initial instructions and initialisation as well as in-depth reflection on the concepts learned and the perceived dynamics to reinforce the take-aways);
5) An *operations concept* (whether and how it can be played and facilitated to allow for the best experience and possible troubleshooting).
6) As we entered the prototyping phase (cp. Figure 1), we began developing sketches and mock-ups of scenes, realising individual quests and riddles as clickable in Power Apps, and gathering extensive user feedback on what works well and what doesn't.

Finally, we were able to create a complete end-to-end prototype, selected scenes of which can be seen in Figure 7.

Figure 7: Virtual Cybersecurity Escape Room Prototype

The close link between user-centred perspectives and tangible, clickable results proved to be essential, as it helped to adjust quickly upon feedback, test the resulting adjustments quickly and amplify from individual quests and riddles to a holistic playing experience.

Discussion

In this article, we have conducted an in-depth analysis of Siemens Healthineers' OpenIT Studio approach for an incubation on IT innovation and digitalisation requirements. We focused on the perspective of an IT organisation and its offering in terms of a "lab" for the business, all Healthineers and IT.

In structuring our analysis, we found that an important aspect of our approach is its integration into the business and digitalisation context. It must be closely aligned with IT's mission to "digitalize the core" and linked to key business goals regarding the digitisation of internal processes. With this in mind, it can serve as a channel for engagement to jointly explore the challenges of digitalisation in an out-of-the-box thinking style and jointly develop creative ideas "from problem to prototype". For each use case, empowering the respective owner of the challenge is a key success factor, as the OpenIT Studio will usually not own the resulting prototypes or solutions for operations. Therefore, these are designed for decentralised maintenance by the owners of the challenge, i.e. citizen developers (cp. [23]). For them, enabling fast iterations and fostering technical skills are crucial for potential solutions.

This article has significant practical implications. First and foremost, it points to the need for an incubation space for cross-company open IT innovation spaces in the course of digitalisation. Numerous use case participants provided qualitative and quantitative feedback at the end of their respective use case (see Conclusion section). Three main categories can be derived from the (predominantly positive) feedback – people, processes, and tools.
In terms of people, there are crucial core roles (cp. Figure 1) and skills for conducting and supporting such a design sprint, as well as the importance of a vital network and a vibrant, supportive culture, especially within the IT expert community. Excellent communication skills and inclusive, cross-functional collaboration are crucial to enabling these challenge-based design sprints.
The process for incubation sprints must allow room for creativity and out-of-the-box interaction while being focussed and even strictly time-limited to achieve tangible and testable results quickly.

In terms of development tools, the use of standard IT platforms and low-code tools can be confirmed to support rapid prototyping while lowering the limits of accessibility for the resulting solutions for non-IT colleagues.
The above results and implications for practice must be considered against the background of some limitations.

Firstly, consistent with its focus on sharing experiences, the article is based on a single in-depth case study. This has prevented us from applying cross-comparisons, e.g., to test a different organisational set-up or different roles. Furthermore, the limitation to a single case study makes it difficult to transfer the results directly to other organisations or industries. However, our peer discussions with

other companies, also from other industries, as well as presentations and discussions at practitioner conferences confirmed the need for such an incubation space as well as the value dimensions outlined.

Secondly, our experience shows that not every digitalisation requirement is suitable for this approach. Challenges or standard IT requests that can be met directly by an existing IT service offering or even an automated routine (e.g., resetting passwords) should of course leverage the direct path and not reinvent the routine if it works well. Large corporate projects with extensive IT implementations also require a specialised project approach due to their size and complexity. In some cases, we may set up breakout sessions during the execution of such projects to creatively tackle a particular sub-challenge. Here, a empathetic balance between opening up and zooming out without losing focus on the specific key challenge is even more important. Furthermore, such large-scale project endeavours might require additional steps and phases, many of which can also be found in the general innovation think tank methodology (cp. [11]).

Third, almost all our use cases take an exploratory approach and also require openness about the potential outcome. We have come across use cases where a solution would have been possible, but only with disproportionate effort and high costs (e.g., for the automation of very infrequent processes with many human interactions). More so, in some cases where several individual solutions would have to be combined into an almost unmaintainable 'Frankenstein'. We do not like the term 'failure culture' for our sprints, because we do not want to cultivate failures, but rather the willingness to accept and deal with 'failure'. In such cases, however, we found the co-creative aspect of the 'healing nature' particularly useful, as it made it possible to experience and test the respective constellations and attempts and thus understand them better.

Conclusion

In conclusion the OpenIT Studio approach has proven valuable in more than 200 use cases to date. It has sharpened and catalysed the fuzzy early-stage IT requirements at Siemens Healthineers in a co-creative, interactive, and iterative way. Underpinned by a strong user satisfaction (> 4,75/5) and promotor score (> 4,85/5) across all use cases, it creates valuable benefits along three main target groups in the sense of the business, all Healthineers and IT.

Firstly, it enables colleagues from the business world to drive digitalisation forward by jointly developing ideas based on the design thinking method from problem to prototype. Here, out-of-the-box thinking perspectives and creative solutions are generated and new IT infrastructure and platform technologies can be explored and applied in the workplace. This leads to lower risks in more complex IT projects or increases productivity through the realisation of functionalities, which in turn leads to lower costs.

Secondly, this approach fosters the knowledge and capabilities regarding training provision and workplace learning for all Healthineers. In this regard, it cultivates user-centricity and design thinking, enabling the exploration of low entry-level solutions, which supports digital transformation.

Thirdly, it is possible for current and potential future IT colleagues to attract talent as the approach strongly incorporates internship students. Digital student talents can apply and improve their skills at work by having an intensive and enriching internship experience, exploring different areas and networking (satisfaction score for the internship experience > 4,80/5 / promotor score: > 4,75/5).

In addition, IT colleagues and business partners can review and discover talent on-the-job so that they can be considered for new full-time employments.

Finally, everyone, talents, IT professionals, business colleagues and the OpenIT team are constantly developing their skills and competences by applying methodical approaches and digital technologies to ever new challenges.

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