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ONBOARDING, A LEARNING APPROACH TO OVERCOME ADOPTION THRESHOLDS WITH EXTENDED REALITY

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ABSTRACT
Never before has restrictions at a global scale due to the Covid-19 pandemic put industry at such unprecedented transformation need. Sustainability by using resources with greater consideration in order to continue to stay resilient, and to thrive post-pandemic has put attention on how benefit the most out of emerging technologies. The advent of extended reality (XR) is today reshaping the way people experience the physical and the virtual environments, from observation to immersion. Due to the turmoil caused by the pandemic technologies that minimize equipment threshold has increased in popularity. Today XR enable experts to be more productive to detect and debug problems and resolve production issues remotely. Currently, both clear advantages and potential disadvantages may exist based on degree of the maturity level of integration. XR provides opportunities for immersive learning, upskilling and renewal. Still, it involves several uncertainties in benefits. XR implementation therefore remain very dispersed among companies. Implementation of these technologies has been considered more to the level of having an inhouse highly sophisticated playground, with potential for later consideration. However, what is missing in many instances is a clear understanding of the impact and transformative mechanisms that AR, VR and MR could provide if only equipped with learnings of how to introduce and adopt knowledge embedded in various use-cases. With a growing experience in testing these technologies the possibilities and requirements needed for successful decision-making are also starting to emerge. Consequently, by understand learning adoption and value drivers in industrial settings, skills practiced in academia can be sharpened not only from a contextual understanding but also to new academic domains and to incentivize implementation initiatives. This paper is looking at distinct value indicators for onboarding as a way for industry professionals to learn new XR skills.

Keywords: Extended reality, immersive learning, industry relevance, value proposition

1 INTRODUCTION
New technologies appear as fast as old ones disappear, and the digital environment seems to be in a state of continual flux [1]. From communication to operations and strategic implications emerging technologies has become a way for enterprises to push forward and innovate for their survival. Swedish industry has been particularly successful showing a strong upswing due to well-founded digital infrastructure to support different new ways of working. In the fourth industrial revolution, communication to operations and strategic implications, emerging technologies has become a way for enterprises to push forward and innovate for their survival [2]. For emerging technologies, the challenge of dealing with uncertainty is many times overwhelming because the technologies have little testing in operating environments leaving several design aspects in the unknown [3]. Using resources with greater consideration has turned attention to continue to stay resilient, and with the potential to eventually thrive post-pandemic digital technologies such as extended reality (XR) has risen in attention [4], [5]. The advent of XR is today reshaping the way people experience the physical and the virtual environments, from observation to immersion. XR is used as the umbrella term, encompassing both augmented reality (AR), mixed reality (MR) and virtual reality (VR). MR consists of high-fidelity holographic 3D models integrated to the real world. AR superimposes virtual and real objects in a real-time display, and VR allows users to control and navigate their movements in a stimulated real or imagined world [4]. Industrial application for XR is vast with a growing body of examples connecting to machines and vehicles that need maintenance, and for technicians that need remote guidance. Still, many companies

have not incorporated parts of XR into their organizational system [6]. With uncertainties in overarching adoption and digitalization processes across different business areas [7], the dilemma for assessing emerging tools with accuracy has arisen with great concern also from the education side [5], [8]. Due to the turmoil caused by the pandemic what is considered as enabling technologies has increased in popularity attention has turned to integration and consequences thereof e.g., adoption thresholds. Currently, XR is becoming more and more significant in promoting industrial products and educating audiences about product offerings and in-built potential. For engineers and designers, the XR technology offers a brilliant way to demonstrate new technologies, products and services at a very early stage. Engineers and manufacturers can by using XR experience their creations before they are built, which has impact on both strategy and the heightened sense of reality.

Since learning attempts and knowledge building is deeply rooted in the performance of complex operations, experiences from more controlled educational settings have potential for commercial practices and vice versa, which may motivate further work in the field [9], [10]. With rising interest in providing guiding examples, experiences from learning practices and adoption steps towards an embedded practice of XR research may support continued practical implementation efforts [11]. Practicing XR in controlled educational contexts have shown that a platform approach to engagement and build-up of lessons learned have been very useful for investigating modular design ideas and assembly work [10]. Attempts that are too short-sighted and concentrate merely on instant return on investment rapidly increase risks for hold-ups constraining expectations of exploration and exploitation. Although research indicates the existence of uncertainty involved in implementation together with an inability to realistically quantify the return on investment [12], the convinced majority with willing to test these emerging possibilities is rapidly growing stronger [3], [8]. The tendency among companies that have been keen adopters of this technology are also strong actors in different part of the supply chain as system providers. A major dilemma for XR implementation is usability, which causes tools to have ripple effects in other part of the company, affecting subsequent change procedures and praxis.

The range of application areas already trying to adopt and make use of XR create an array of opportunities to provide for smoother knowledge acquisition and establishment of new skill sets. Although a myriad of critical challenges exists, difficulties in overcoming technology thresholds provide by default a readiness gap that may early put down good intentions too early [13]. Essential knowledge is currently limited concerning digitally enabled adoption and implementation to support innovation and strategic management [4], [6]. The weakness in adoption rate shown by industry has led to a strong technology push where reluctant attempts to incorporate short-sighted solutions creates an overwhelming dissonance towards leveraging the potential of XR. This research paper put attention on minimizing the uncertainties that many of today's industries face when adopting XR. Assessing value from perceived actions using XR cause a mapping of pros and cons that has implications on aspects ranging from tools, implementation, operations, learning, performance, output/performance, and strategy. Potential benefits in relation to maturity level makes it vulnerable also in relation to security concerns. This way adoption and integration become a critical strategic concern although direct benefit resonance differently between operations and management. XR allow the possibility to discern different effects of diverse sensory or perceptual stimuli on multiple levels of immersion and presence. This support designers to select suitable technological features to stimulate the desired immersion and presence [14]. Understanding how to adopt and properly learn from XR become critical, consequently, aspects relating to assessment becomes fundamental to better establish a harmonized adoption of XR to enable a suitable toolbox for leveraging learning, embedded value, and performance drivers.

2 STATE-OF-THE-ART

Understanding the how to adopt and properly learn from new technologies become critical, especially during societal digitalization transformation. The number of publications on XR technologies has escalated in recent years in areas such as manufacturing assembly [16], educational and skills learning purposes [10][11] and challenges for industrial implementation [15]. Although XR technologies are increasing at shopfloors, there is still need for further validation to make good strategic decisions regarding implementation [6]. In support for this upswing is a genuine growth in digitalization skills, and an increased use of XR to provide organizations with transformative power. Based on the scarce existence of research targeting application adoption of XR, the connection between learning progression and professional training, e.g., manufacturing training has until now recently been kept underexposed [16]. Features that bring most attention when testing XR for learning purposes is a general belief that it

provides a 'learning advantage' (43.75%), and that XR also increases 'motivation' (31.25%) [8]. People's anticipated role expansion due to immersion when they are involved in XR need to be part of a strategy and operational tactics so that human aspects does not set aside and cause promising attempts to early failure. Such attempts impede learning and production of use-cases that can provide valuable business opportunity to pursue further [9]. Insufficient resources allocated in-house with knowledge around XR and with a network to build progression around it as competence area in-house only minimizes potential offsets. Past attempts place XR in loopholes or vicious circles that leaves strong business cases of implementation value unexplored [15]. This involves, integration of data and information which can potentially be facilitated at different levels of maturity [18], and people, processes and technologies that are important to balance as part of a digitalization process [19].

3 PURPOSE

Building on challenges and attempts of existing XR frameworks [15], [17], capabilities and antecedents that incentivizes XR as part of a mechanism for change [8], the purpose is to bridge potential thresholds. Consequently, refinement is a natural ingredient in an iterative approach to overcome obstacles and creating a better fit, thus the research question is kept relatively broad. Using the theoretical lens that outline a technology acceptance model, decisions to adopt emerging technologies have shown to deviate based on technology readiness and usability thresholds [20]. To expand insights and make adoption processes more concrete capability growth concerns has been vital in exploring potential value [21]. Consequently, the study is approaching XR implementation from a meta perspective on engineering design education where insights to the adoption process and research question is formulated as follows; 'How can adoption of XR translate corporate value benefits to readiness for immersive learning?'

4 RESEARCH DESIGN

This paper is merging industrial needs for extended reality through the adoption of new technologies allowing shorter and intensified ways for creating efficiency in both learning and performance. By adopting a snowball approach to increase our understanding a process where probing questions were used. The guiding questions were given on several occasions has taken place with four industry professionals, one solution provider, and together with four different teachers. Also, a case company specializing in AR solutions was investigated using a triangulated method. This involved the XMReality's (XMR) Onboarding programme and involved internal archival records, interviews with responsible onboarding managers and technical specialist, and the customer success manager. Based on implementation steps, distinctions have been made to determine stepwise actions to speed up the learning curve among users and features that can support to distinguish value-driven learning processes. To extend authentic use-case practices as usefulness and applicability has been central pillars. Besides the case description four additional interviews and one remote assist workshop with industry experts' experiences has been gathered for the purpose of an explorative study with aim to address XR adoption thresholds. By purposely using pedagogical guidance and testing, the initial overview of XR was initiated during 2021 and explored XR value propositions and demo workshops where distinct features were presented. Interviews followed with both adopters and tech providers concerning critical use cases and perspectives on how to manoeuvre strategically a transition towards an integrated use of XR.

5 THE XMREALITY ONBOARDING PROGRAMME

The XR learning process at XMR has five steps with to reassure user adoption, and as customer it is aimed at shortening integration time, minimizing thresholds and building an in-house expertise in the form of domain specific knowledge repositories. Assessment from a corporate perspective has been highly concentrated to individual value gains that can be portrayed in various use-cases. This learning process has been developed and fine-tuned recently resulting in a formulized routine, the "Onboarding programme," which runs for approximately three months. The steps are as follows:

1. **Handover from sales**
   The first, internal, step when the sale has been made is short handover from Sales manager to Customer Experience (CX) team, with relevant information about the customer and deal for the CX team to know prior to the onboarding begins.
2. **Get Started**
   CX activates domain and contact the customer to schedule a kick-off meeting.

3. **Kick-off Meeting**
   In the kick-off meeting XMR aim to understand the customer the best way possible to tailor the onboarding to their needs. Discussions with the customers concerning intended use cases, roll-out plan, objectives and how to measure success, training and follow ups. At this stage discussions are more concentrated to what the customer has defined themselves and XMR's role is here about giving reasonable suggestions and inspiration.
4. **Training**
   Conduct the trainings as decided upon at the kick-off meeting. Based on a variety of offers depending on user needs, functions like "admin", "user" and "smart glasses" are provided through distinct training programmes. Learning efforts are focused and aimed at the customer's proper target group, meaning that tools are provided on a teaching the teachers manner. Execution differs between on-site exercises or in formats that solely concentrate on different forms of remote practice.
5. **Roll out**
   Involving users in the process with communication, training, testing and start using the software within the company. In practice, step 3 is embedded as part of step 4 yet with the importance of clarifying uncertainties in user-derived needs.
6. **Follow ups**
   XMR do three follow ups with the customer during the onboarding, about two weeks after training, after one month, and three months. These follow ups are provided with three different aims. The first aim is to make sure that initiation is properly set align with the short-term goals. Next aim is a follow up on software and potential need for revising goals for the upcoming time period. Lastly, evaluation of the onboarding and updating of the goals takes place, also long-term goals are decided upon based on parameters for continued partnership and dialog for post sessions once onboarding is finished.

As part of the defining process XMR place much attention upfront to understand the distinct learning challenge ahead. Potential to bring users to a more enhanced level make commitment and engagement a priority on company level as well in the attention to the individual user. Unless this is done properly, it will become difficult to maintain a smooth adoption process, causing a lower value from existing users. By strengthening the adoption process, XMR follows up on the status of their active users to determine how they are performing in contrast to their targets and defined use cases. The company seeks to define milestones for the customers related to purchases, user adoption and activities to push the customer forward. Prior to the release of the systematic onboarding programme, the users were given crash-courses that they paid separately for and were given 1-2 hours training, and once done users were seen as "seen as ready to go". The onboarding programme has allowed XMR to follow the customer journey, and to manage problem and queries at an early stage. The tool is also communicated as "simple to use" but despite that XMR could see a low user adoption and realized that it is not only related to understanding the tool but also change management in terms of changing old ways of working. To facilitate customers concurrent meetings, they build upon users' preferences to establish deepened commitment to benefits and gains established to leverage involvement.

6 FINDINGS & ANALYSIS

Important success factors related to the onboarding programme:

- Allocate resources on management level close to end users and identify "site champions" to support users and push user adoption. Commitment is necessary on all levels.
- Allocate time for users after training to test and become comfortable using the tool prior to using it for real with customers.
- Important for the people giving assistance to understand both sides of using the tool to understand what the person receiving assistance sees.
- Important to distinguish between the value for top management and the value for end users as there are often different driving forces between the two groups.
- It is therefore important to involve end users in the process and following up with them for a successful roll out in the organisation.
- Once end users see the value the tool brings them, user adoption increases, and change happens from the bottom up. This step has provided XMR with some of their most successful use-cases characterized by high satisfaction, motivation to further exploit interaction possibilities.

- To increase success rate, it has been important to start small with clearly defined use cases.
- Define and change processes to incorporate the use of a new tool into a new way of working.

In responses from the tech experts, both short-term and long-term ambitions mention upgrade and the potential to leverage intelligence across the organization. XR provides a prominent way to accelerate decisions, reduce costs, increase productivity and improve worker safety. From the tech user perspective, implementation of XR involves, but is not limited, to technical layout and information flows. With rapid increase and demand for systems that are self-sustained, visual and remote access to existing knowledge become more vital than ever. Preparation of a smooth transition interface, i.e., using clear routines and highlighting transparency via communication, can potentially increase impact of use-cases. The Onboarding sequence that aims to reassure user value along the implementation phase is deemed successful by the case company XMR as they recently formalized a path forward to support new users. Customization has become a way to deliver high end solutions and continuous feedback and with the preferred updates. This has also become to shorten learning curves and to minimize thresholds and potential bottlenecks in application and up-time in using XR tools. Features that could engage operations through visual execution provides further secure processes where XR could expand their both individual and factory engagement in value-driven processes and knowledge expositions rooted in employees. From an individual's perspective XR tools provide both room as boundary spanners where actors can experience more depth than ever before and with the opportunity to go beyond traditional domains and expected roles.

With industry and universities having distinctively different purposes for adopting XR, authenticity become vital in order anchor relevance from an individual level whereas flexibility in form of task benefit and time become more powerful from an organizational level. Three distinctions are made to successfully scale up activities in relation to learnings and value propositions based on this study; ***i) generated XR value***, i.e., what is accounted for, and based on what considerations? ***ii) time-on-task***, individual learning should benefit mastery to overcome domain specific knowledge, hours of systematic testing and exploration provide useful slack when extending operations act, ***iii) learning approach***, avoid short-sighted efficiency since not everything will run smooth from start, be progressive and accelerate so that leadership may mobilize. As past research [16], [20], [21] has pointed out adoption of i-iii) involves alignment of a technology acceptance model, allowing decisions to deviate with less regarding technology readiness and usability [15]. Experiences address how contributions can advance conceptual and practical understanding of XR implementation as the findings are expected to provide more solid empirical evidence that put the cases of provider and user perspectives as ubiquitous sources of scientific and experienced knowledge.

7 CONCLUDING REMARKS

This paper explores ways to overcome adoption thresholds of XR by building on authentic educational challenges rooted in an industry relevance. To enable an educational scale-up, the paper reveals the existence of a synergy between functional learning environments and individual learners. The introduction of onboarding programmes such as the one XMR have introduced show distinct features on how to facilitate users' attention rate and at the same time roll-out a smooth adoption process. From an educational point-of-view lessons learned, i.e., experiences gathered in use-cases, are vital to utilize and also to build wisdom from as these can disrupt traditional practices, remove thresholds and increase transformation power. A structured process to facilitate existing users and new adopters involves high degree of 'guidance,' where a self-directed learning approach is used to establish interaction value. Continued research has an important role in building more knowledge on how use-cases and engagement level can provide a strategy towards tolerance for failure, tolerance for design, and tolerance for efficiency.

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