Report

"CyberWiseKids": Gamifying Education of Kids on Online Opportunities and Security Risks

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ABSTRACT

Abstract heading
This report summarizes the motivation and the goals of the "CyberWiseKids" project proposal. The proposal was designed by SINTEF in 2015 and revised in 2016, with the aim of developing a research and innovation project which would involve several industrial and academic partners from Norway and Europe. The underlying idea was motivated by the need for enabling children and young people to make the right balance between online opportunities and online risks. A significant innovation potential was envisioned and elaborated within the proposal. Although far less detailed than the original project proposal and excluding several major aspects (e.g. innovation, organization, project plans research questions, and state of the art) that were part of the original proposal, this report quotes and reproduces the parts (of the original proposal) regarding motivation, challenges, and the objectives. The purpose of this report is to enlighten the persistent challenges that young people are facing while being online, as well as to indicate the still-existing needs and opportunities for addressing such challenges through innovation and research.

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APPENDICES

The paper entitled "CyberWiseKids": Gamifying Education of Kids on Online Opportunities and Security Risks

"CyberWiseKids": Gamifying Education of Kids on Online Opportunities and Security Risks

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This report summarizes the motivation and the goals of the "CyberWiseKids" project proposal. The proposal was designed by SINTEF in 2015 and revised in 2016, with the aim of developing a research and innovation project which would involve several industrial and academic partners from Norway and Europe. The underlying idea was motivated by the need for enabling children and young people to make the right balance between online opportunities and online risks. A significant innovation potential was envisioned and elaborated within the proposal. Although far less detailed than the original project proposal and excluding several major aspects (e.g. innovation, organization, project plans research questions, and state of the art) that were part of the original proposal, this report quotes and reproduces the parts (of the original proposal) regarding motivation, challenges, and the objectives. The purpose of this report is to enlighten the persistent challenges that young people are facing while being online, as well as to indicate the still-existing needs and opportunities for addressing such challenges through innovation and research.
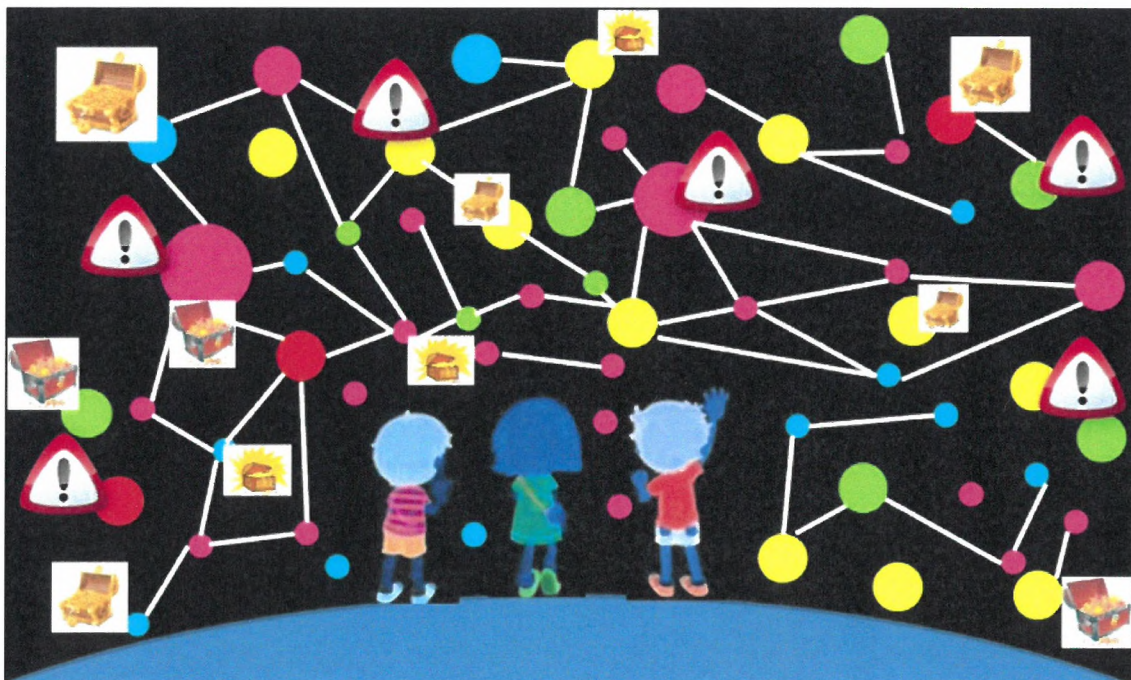

Figure: Internet is a new universe of fantastic opportunities and many risks

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1. Underlying idea

> The objective of the CyberWiseKids project proposal was to create profitable new **products** and **services** by **gamifying education** on **online opportunities** and **risks**. This was expected to strengthen competitiveness and market opportunities of Norwegian publishing, gaming and e-learning industries, both nationally and internationally. The targeted end users of these products and services were children 9 to 16 years old.

The CyberWiseKids proposal aimed to create playful solutions for empowering children and young people with creative and critical digital skills, in an engaging and motivating way, by innovating gaming technologies in cooperation with the publishing, gaming and e-learning industry. CyberWiseKids aimed to contribute to a better utilization of gaming technologies for educational purposes. This was, in turn, expected to strengthen Norwegian companies in the publishing, gaming and e-learning industry in their competitiveness and market opportunities, nationally and internationally. CyberWiseKids wanted to support both the individual competence level and early education on the changing opportunity/risks situations among children. Such competence was and is increasingly essential, as social media and emerging mobile technologies have forever changed the childhood.

The youth of today are spending more and more time online, often without supervision: young people between 14-16 years spend on average 5-6 hours online daily [3]; 85 per cent of 10-11 year olds have their own smartphone [1]. Increasing access and use of the Internet provides children with fantastic opportunities that are not being fully exploited in Norway, Europe and the rest of the world [2,3,4]. IKT Norge[1] argues [5] that the lack of digital competence and education will result in 15000-17000 unmanned positions in the ICT sector by 2020. Similarly, Horizon 2020 emphasizes the importance of empowering children online and improving children's digital competence for their later creative and innovation skills. At the same time, children are increasingly exposed to online risks [6,7,8,9], such as pornography, bullying, sexual messages, contact with people they do not know face-to-face, offline meetings with online contacts, potentially harmful user-generated content, exposure to public contempt, victimization, various kinds of unintended surveillance, and personal data misuse. A central dilemma is thus how to support children to engage in productive and creative social learning on the one hand, and how to protect them from online risks on the other [10].

In CyberWiseKids project proposal we argued that crucial digital competence is the capability of making the right balance between online opportunity and online risk. The proposal argued that the real challenge for digital children was to employ this right balance in various online contexts. For example; should he or she exchange information while doing a collaborative work although critical information can be leaked? Should we discuss personal opinions online if they can be overheard or misused? Should we watch a video that may infect the computer? Almost always, there is a potential gain which also involves a risk of some kind. These potentially risky situations require awareness and active reasoning from the user.

But how can we teach a generation of digital children to avoid online risks and increase the take-up of online opportunities at the same time? Interaction, motivation, involvement and fun are key success factors in many new business models for educational services. Serious games have successfully been employed in teaching children various subjects [11,12,13,14], e.g. math and language, in an entertaining and engaging way. Gamification has demonstrated useful assets needed to educate children in an engaging and efficient way. Our argument was that we needed to engage kids in opportunities and risks online, in open knowledge sharing by the use of serious gaming and gamification. The overall novelty of the CyberWiseKids proposal was gamification of digital empowerment of children and young people, and more specifically: *serious gaming approach to user-centered and adaptive training in cyber security risks and online opportunities*. The key

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[1] IKT Norge is the interest group for the Norwegian ICT industry.

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challenge was to innovate these new products and services in a way that would make them engaging, motivating, attractive, fun and educative, so the kids actually want to buy and use them.

The goal of the CyberWiseKids project proposal was to fill the gap in existing educational services, by developing distinct gaming services for children to support their need to take-up online opportunities and avoid risks. The proposal aimed to set the standard for this type of service nationally and internationally. This objective was in line with the priority area for the Norwegian government, namely to support and raise the Norwegian game industry [15] in a competitive international gaming market. Our target group in CyberWiseKids was children between the age 9 and 16 years. By addressing this age group, we aimed to influence actual attitudes and behaviors of young people. The traditional education on online opportunities and cyber security is done through classroom teaching and booklets. Children's digital competence depends highly on their own interests and efforts. The intended CyberWiseKids products and services were considered to represent innovations that would align with the desired digital competence in education. The rationale was to avoid static knowledge and a far less active and engaging learning process that are often the case in traditional classroom-based teaching centred around vertical knowledge sharing. CyberWiseKids also aimed to support open horizontal knowledge sharing, where peers could learn from each other in an interactive game environment.

We aimed to raise critical knowledge and awareness regarding online opportunities, security risks and online code of conduct. This was considered as crucial competence for a digital generation to manage both creative and critical thinking while online. Examples of relevant knowledge include available resources, technologies, aids, regulations, threats, as well as preventative and corrective measures to the risks. As such knowledge constantly changes and can easily become outdated, we also intended to support dynamic content updates of the CyberWiseKids products and services. Moreover, CyberWiseKids products and services aimed to facilitate training in an efficient and fun manner, through the adaptive and individually customized pedagogical approaches, educative game design and dissemination of new knowledge through dynamic content updates.

2. Objectives

> The primary objective for the R&D activities of CyberWiseKids was to enable efficient, adaptive and motivating game-based education of children on online code of conduct, by creating unified knowledge and solutions that span across the disciplines of human-computer interaction, security risk management, and learning science.

Unlike the approaches traditionally used for teaching children online code of conduct, CyberWiseKids aimed to take advantage of state-of-the-art on gamification, adaptive learning, and risk management, thus maximizing learning effects, user experience and actuality/relevance of the contents. Reaching this objective would require development of business models that would enable easy and profitable dissemination of the CyberWiseKids products and services. It would also require development of multi-disciplinary knowledge, methods and tools that would enable efficient, user-customized and motivating teaching of children on online opportunities, cyber security risks, and ways of dealing with opportunity-risk balance, based on serious games. Thus, the planned R&D activities aimed to provide the knowledge, methods and tools needed for:
1. Acquisition of the knowledge that would need to be communicated to the user groups,
2. Story telling around the knowledge to be communicated,
3. Dynamic contents update of the CyberWiseKids products and services with most recent knowledge and the corresponding stories,
4. Adaptive learning which would customize the CyberWiseKids products and services to the level and learning speed of the user.

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Since the games would be updated dynamically and differ with respect to the geography, knowledge level, age etc. of the user, we needed tools and methods that would support the proper set-up, configuration and usage of the tools according to user's profile.

To achieve the primary objective, we identified the following secondary objectives (SO, also referred to as sub-objectives) of CyberWiseKids:

Nr	Objective
SO1	Develop viable business models for profitable world-wide dissemination of CyberWiseKids products/services to the mass market.
SO2	Develop methods and tools to identify the knowledge about online opportunities and cyber security risks and propose how to deal with them.
SO3	Develop methods and tools that dynamically update CyberWiseKids products and services with most recent knowledge about online opportunities and cyber security risks.
SO4	Design (until prototype) the CyberWiseKids products and services that are highly motivating and entertaining to the users and adaptive to individual users' needs, while they are at the same time efficiently teaching the knowledge identified regarding the online opportunities and risks.
SO5	Find the good methods and metrics to evaluate learning effects of the CyberWiseKids products and services.

5. Need for research

Gamification of security training of youth is cross-disciplinary and the main research challenge was in the intersection between cyber security risk management, user experience, media science and learning science. State of the art did not provide the ground needed for creating the innovations which would efficiently integrate the cyber security risks and online benefits into serious games targeted towards children and young people. The main challenge of CyberWiseKids was three-fold:
6. Identify and dynamically update the most recent knowledge on online opportunities and cyber security risks, including the guidance on how to deal with them;
7. Design the CyberWiseKids products and services so that they are attractive, highly motivating and entertaining to the users, at the same time as they efficiently educate on the above mentioned up-to-date knowledge; and
8. Reach the sufficient number of users.

The first challenge required research activities which would span over research areas of cyber security, online media science, risk management and cost-benefit analysis. This would include software engineering research on how to provide efficient dynamic updating of the new knowledge as well as how to make the products light-weight and compatible with mobile devices. The second challenge required research activities which would span over research areas of user experience, game design and learning science. The two objectives were highly interrelated and required a tight collaboration between the different disciplines. Another cross-disciplinary need for research was the empirical evaluation of the effects of the CyberWiseKids products and services with respect to learning, online safety, and ICT empowerment in general. The third challenge required expertise in marketing and business models.

The question was how to make the CyberWiseKids products and services alluring in their own right so that they would be attractive for the mass market. Research activities would improve the value propositions of the CyberWiseKids products and services, and hence speed up their uptake in the international market. Serious games for digital empowerment could not only target the children with special interests in computers nor only those that are affluent and have the resource above the average to afford them. We needed to have value propositions that would appeal to the majority of consumers. We also aimed to strive at increasing gender

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balance in the technology adoption. The R&D activities were designed with these objectives in mind. By uncovering what constituted gratifying user experiences, this knowledge would be applied in design activities for the project partners, to ensure the objective is met.

To address the challenges, the research aimed to make the CyberWiseKids offerings attractive to both genders, customized to the user groups (e.g. age, geography, level), easily applicable on mobile devices, contextualized (e.g. local heroes, users interests), applicable in short time intervals, and easy to interact with (e.g. with a single finger, in noisy environment). We also aimed to develop new knowledge on needs of the different user groups, on how serious games would fit in the existing educational system as well as the gaming market, so that it would indeed alter the market place in order to reach a greater majority of consumers. We expected to benefit from existing disruptive business models in the e-learning and gaming market which had already leveraged the power of online social networks and smartphones. CyberWiseKids planned to assess the business feasibility of the services and products that would be developed in the project. Different business models would be identified for each of the industry partners. The business models were intended to be designed in a way that would enable collaboration between partners and access for third parties to service platforms and networks, in order to to meet both our current and future educational challenges.

9. Conclusions

Young people face numerous risks while being online. At the same time, the opportunities enabled through digital participation are the cornerstone for their education, as well as their professional and social life. This report summarizes the motivation and the goals of the "CyberWiseKids" project proposal which was designed by SINTEF in 2015, with the aim of developing a research and innovation project involving several industrial and academic partners from Norway and Europe. CyberWiseKids project proposal argued that crucial digital competence of young people is the capability of making the right balance between online opportunity and online risk.

The objective of the project proposal was to provide the research needed for addressing the challenges imposed by the online exposure while realizing the innovation potential. The innovation would namely entail creation and market uptake of profitable new products and services through gamifying education on online opportunities and risks. If successful, such a research and innovation project would be expected to strengthen competitiveness and market opportunities of Norwegian publishing, gaming and e-learning industries, both nationally and internationally. The purpose of the report is to enlighten the challenges young people are facing while being online, as well as to indicate the still-existing needs and opportunities for addressing such challenges through innovation and research.

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