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Introduction

The objective of the anticipation of competences and skills needs that is carried out by the Finnish National Board of Education is to produce a qualitative description of the competences and skills required in working life in the future. In particular, the anticipation data strives to respond to the needs of the educational administration, providers of vocational education and training, educational institutions, polytechnics and universities to obtain up-to-date information on this subject. For example, it must be possible to utilise the information produced by the anticipation process to develop qualification requirements, curricula and qualification structures.

An operating model for anticipating competences and skills needs was developed in the National Project on Anticipation of Competences and Skills Needs (VOSE) carried out by the Finnish National Board of Education on 1 June 2008–31 May 2012. The project was implemented with funding from the Finnish National Board of Education supported by the European Social Fund. After the VOSE project, anticipation of competences and skills needs has become an established part of the Finnish National Board of Education’s activities. The so-called VOSE anticipation model is also the primary way for the National Education and Training Committees to perform sector-specific anticipation work, and the Finnish National Board of Education supports the committees in this work.

During 2010–2013, the VOSE anticipation model was used to implement anticipation projects in real estate and construction, child day care and family welfare, tourism and catering services, the graphic industry, and elderly services. The games industry anticipation project began in late 2014, and the anticipation group met for the last time in May 2015.

An anticipation group made up of experts in the sector was put together to anticipate competences and skills needs in the games industry. The composition of the group is presented in appendix 1. This publication reports on the results produced by the anticipation group for the games industry. When looking at the results we should note that, rather than being the views of the Finnish National Board of Education, they represent the outcomes of the anticipation group’s work. Rather than predict accurately the future of the sector, the purpose of the anticipation work was to understand future scenarios and potential trends. It is unlikely that any of the scenarios discussed in this publication will come true as such, and the truth will be “something in between”. However, by anticipating alternative future scenarios we can find competences and skills that we are very likely to need in the future.

Chapter 1 of the report presents the implemented anticipation process. Chapter 2 describes the current operating environment in the games industry and, among other things, it includes competences and skills needs that were identified in job announcements and interviews. Chapters 3 and 4 contain an introduction to the drivers of change and scenarios defined by the anticipation group.

Chapters 5–7 describe the future competences and skills needs that the anticipation group identified by individual scenarios, by areas of the games industry, and by professional groups. A summary of the future competences and skills needs that apply to the entire games industry is presented in chapter 8. The proposals for developing education
in the sector that were created in conjunction with the anticipation work are presented in chapter 9.

The report was written by Counsellor of Education Ulla Taipale-Lehto and Senior Advisor Jukka Vepsäläinen, who was also responsible for the anticipation process. Assistant Riitta Siitonen contributed to the finishing touches on the report. KPMG Oy served as a facilitator during the anticipation process.
Abstract

The Finnish National Board of Education implements sector-specific anticipation projects, the aim of which is to produce data concerning future competences and skills needs for each sector that is the target of anticipation. The resulting anticipation data can be used in development of the contents of vocational education and training as well as polytechnic and university education to better meet the needs of the future working life. The anticipation work utilised the so-called VOSE model, which was developed in the Finnish National Board of Education with support from the European Social Fund. The VOSE anticipation model is also the primary way for the National Education and Training Committees to perform sector-specific anticipation work. The games industry anticipation project, the results of which are reported in this publication, is the sixth anticipation project carried out with this model. The games industry anticipation project began in late 2014, and the anticipation group met for the last time in May 2015.

For the purposes of anticipating future competences and skills needs in the games industry, the project put together an anticipation group composed of representatives from nine different National Education and Training Committees and other experts. After the kickoff meeting, the anticipation group met at four one-day workshops. These were followed by a final meeting to expand on the results produced so far and confirm that the reporting corresponded to the group’s views.

In this project, the games industry was defined as follows: “In this anticipation process, the games industry means business that designs, programs, manufactures, markets, publishes and distributes digital computer, console, video, internet, mobile, browser and simulator games. Although this definition of the games industry does NOT include actual device manufacturing (computers, game consoles, peripheral game devices, etc.), or gamification in a broader sense (the entry of gamification to all parts of life and subsequently to all business and all private and public service production), these matters can be taken into consideration in the competences and skills needs for the games industry (however, we are not specifically producing competences and skills needs for e.g. device manufacturing”).

After considering key drivers of change that will have an impact on the games industry in the future, the anticipation group moved on to define alternative future states for the services and, using the futures table method, created four different scenarios for the sector. Starting with these scenarios, the group worked on future competences and skills needs and proposals for developing education and training. The time perspective used for the anticipation work was 10–15 years ahead.

The following emerged as the key competences and skills needs for the various scenarios, areas and professions:

- Competences and skills related to community management, handling a company’s social relationships
- Competences and skills related to productisation, turning a business idea into productive activity, sales and marketing competence, branding competence
- Competences and skills related to target group scalability, the ability to adapt the basic idea of a product or service for different target groups
- Ethical competence, professional ethics and observing the ethical values of work
Data analytics competences and skills, big data utilisation competences and skills

- Competence related to new technologies, now, for example, competence related to wearable games, competence related to sensor and detector technology and augmented reality (technologies develop rapidly, which requires continuous monitoring of development)
- Competences and skills related to gamification, design of gamification
- Competences and skills related to serious games, with teaching and education and well-being and health serving as good examples
- Skills in establishing relationships and networking, internalising a partnership mentality
- Cultural knowledge, multiculturalism competence
- Team work skills, the ability to use agile development methods in projects, creative organisational leadership skills, competence related to new forms of cooperation

At no point during the anticipation process were the future competences and skills needs put into order of importance, and the same applies to this report. However, the group did emphasise the significance of competence related to productisation and branding.

Background material used in the work included an operating environment description for the games industry produced by Foredata Oy, the content of which is summarised at the beginning of this publication. For example, the operating environment description included an analysis of competences and skills needs for the games industry that was derived from job announcements and data produced by C&Q Systems Oy from interviews conducted for work organisations.

The anticipation process also made use of a questionnaire survey conducted for the secretaries and chairpersons of 26 National Education and Training Committees in different sectors, which asked about their views concerning the interfaces between their own sectors and the games industry.

This publication describes the future drivers of change identified by the anticipation group, the four scenarios prepared by the group, and the future competences and skills needs shared by several scenarios. The report also discusses the competences and skills needs of each scenario by area of the sector and the professional group selected for review. The group also anticipated that some new professional groups would develop in the industry. The above-mentioned sections has been summarised to provide a list of the key competences and skills needs for the entire games industry. In addition, the anticipation group's proposals for developing education are presented. This report on the competences and skills needs for the games industry summarises the outcomes of the anticipation group's work and does not represent the official view of the Finnish National Board of Education.

The Finnish National Board of Education was responsible for the anticipation process and was facilitated by KPMG Oy.
1 About the anticipation process

VOSE process
The VOSE process and method was utilised in anticipation of competences and skills needs in the games industry. The VOSE process and method were developed in the National Project on Anticipation of Competences and Skills Needs (description of the anticipation model developed in the VOSE project, 2013). VOSE is a step-by-step, creative group work process based on participation, in which views are generated about the future of the operating environment, business changes and future competences and skills needs in the sector that is the target of anticipation. The objective is to produce data for education providers and decision-makers concerning competences and skills needs in the selected sector, cluster, value chain or other business, or administrative sector. The VOSE process usually lasts for about six months and produces data that serves decision-making for a few years into the future. The time frame for anticipation, or planning time line, generally extends 10–15 years ahead.

The anticipation group, facilitators, and process owners
Like other similar VOSE processes, the anticipation process for competences and skills needs in the games industry was owned and implemented by the Finnish National Board of Education. Practical workshop work is usually guided and carried out by an outside service provider. Facilitation in this games industry project was handled by the consulting company KPMG. In accordance with the VOSE model, the facilitator planned and guided the work at workshops, compiled memo about the progress and outcomes of each anticipation workshop, and carried out feedback and commenting surveys between the workshops.

An anticipation group was established for the actual anticipation work and content production. Representatives from three National Education and Training Committees that are closed linked to the games industry formed the core of the group. These committees were the National Education and Training Committee for the Electrical, Electronics and Information Technology Sector, the National Education and Training Committee for the Computing Sector, and the National Education and Training Committee for the Communications Sector. In addition, representatives from six other National Education and Training Committees wanted to participate in the work. These committees were the National Education and Training Committee for the Rehabilitation and Sports Sector, the National Education and Training Committee for the Music, Theatre and Dance Sector, the National Education and Training Committee for the Education and Guidance Sector, the National Education and Training Committee for Visual Arts, the National Education and Training Committee for the Crafts and Design Sector, and the National Education and Training Committee for the Mechanical and Metal Industry.

The other half of the anticipation group consisted of experts from outside the National Education and Training Committee system. This included representatives from games industry companies or consortia, employer and entrepreneur organisations, employee organisations and trade unions, the student field, educational institutes providing training in the sector (vocational institutions, polytechnics and universities), as well as from labour administration, Tekes, Statistics Finland, Finland's Slot Machine Association, and Veikkaus (Finnish Lottery). The composition of the anticipation groups is presented in appendix 1.
**Stages of the process**

After selection of the sector for anticipation, preliminary negotiations were held with the key National Education and Training Committees related to the sector. Prior to starting the work and putting together the anticipation group, the target of anticipation also had to be specified. In this sense, the games industry was not easy to define. Statistics Finland does not have a separate category for the games industry or games industry. The definition was written with the aid of literature sources and a chart of it drawn up, which, along with a few questions, was sent to four games industry experts. Based on the responses to this mini-survey, the games industry was defined as follows:

“In this anticipation process, the games industry means business that designs, programs, manufactures, markets, publishes and distributes digital computer, console, video, internet, mobile, browser and simulator games (the left side of the chart). Although this definition of the games industry does NOT include actual device manufacturing (computers, game consoles, peripheral game devices, etc.), or gamification in a broader sense (the entry of gamification to all parts of life and subsequently to all business and all private and public service production) (the right side of the chart), these matters can be taken into consideration in the competences and skills needs for the games industry (however, we are not specifically producing competences and skills needs for e.g. device manufacturing)”.

**Figure 1. Indicative definition of the games industry in the VOSE anticipation project prior to starting the process.**

Both before and during the work, there was discussion about whether the right upper side of the chart should be included in the review – or whether it could even be avoided. As the process progressed, it became apparent that, in particular, the upper right side of the chart, development of serious games, is a key future direction in sector development. These thoughts play an important role in this final report.
Background for the anticipation work was obtained by commissioning a background report, which was an operating environment analysis of the games industry situation in Finland (Järvinen & Andolin 2014). This report provided a brief description of the current state, education and NGOs in the sector and development projects in the sector in Finland. In addition, two sets of data were compiled for the background report, and tailored only for this report: an analysis of job announcements in the games industry (Foredata Oy) and a C&Q competences and skills needs analysis (Taina Hanhinen, C&Q Systems). The central content of the background report is described in the next chapter of this report (chapter 2).

The anticipation process for the games industry was launched with a kickoff meeting on 27 November 2014. The group’s assignment was declared to be an evaluation of the future of the games industry, and specification of changes in business and competences and skills needs. The aim was to produce data to serve the development of education for the games industry. Once the group members became acquainted with each other and the technical framework of the process was verified, the first workshop was held on 17 December 2014.

The participants in the first workshop worked as individuals and in groups to consider the key future drivers of change for the games industry. Future changes were initially brainstormed with the aid of introductions related to the morning’s topic and systematic idea generation. The drivers of change were discussed and eliminated by putting them in order of importance on the basis of uncertainty and significance. Finally, the most central drivers of change were selected as the foundation for future work.

At the second workshop on 15 January 2015, the drivers of change that were selected at the first workshop were further defined and supplemented. The issue was also probed by means of a feedback survey conducted between the first and second workshop. The next step involved positioning and describing the drivers of change so that they would form different scenarios. The futures table method was applied to building the scenarios. Four different scenarios were defined and named. To begin with, the scenario models were

1. Business As Usual
2. Desirable scenario, one of strong growth or blossoming in the sector
3. Undesirable scenario, one of decline in the sector
4. Surprising, wild and startling scenario

The next step was to develop stories to describe each scenario by means of customerships. The first step was to brainstorm customer types, select the most important of them and describe their characteristics by scenario. The outcome was a story to describe each scenario. Outlining the competences and skills needs for each scenario was left to the next workshop.

A survey related to the games industry was sent to the National Education and Training Committees that were not involved in the process between the second and third workshops. This so-called interface survey was sent to the chairpersons, deputy chairpersons and secretaries of the 26 National Education and Training Committees. Responses were received from 10 of the committees. The results were presented at the beginning of the third workshop.

The third workshop on 12 February 2015 started by briefly returning to the outcomes of the previous workshop by putting the finishing touches on the scenarios, expanding on
the customer type descriptions by scenario, and further defining the stories by adding a customership section, or customer story, to each one. The scenarios are presented in chapter 4 as the anticipation groups wrote them. The third workshop also included a presentation about competences and skills needs in the games industry (Jussi Tähtinen, Nitro Games Oy). After this, the competences and skills needs were specified for each scenario. Customerships and their needs must be taken into consideration when defining competences and skills needs. The competences and skills needs were placed into one of three categories: general, special and new. To assist in understanding them, games industry activities were divided into areas or professional groups. Although, these categories vary from one business to another, the areas in the tourism industry could, for example, be restaurant services, accommodation services, programme services, sales and marketing. Correspondingly, the professional groups in restaurant services could be restaurant managers and shift managers, chefs and waiters, etc. Work on dividing the competences and skills needs for the games industry into professional groups by scenario was started at the end of the third workshop.

At the fourth workshop on 10 March 2015, the final areas and professional groups were defined and selected, and the competences and skills needs for them specified in the different scenarios. The last work stage of the last workshop focused on needs for change in game-related education and training from the educational level aspect. First, the most important competences and skills needs for the games industry were summarised according to what exists and what there should be in the future. In addition, the competences and skills needs were presented by educational level. Finally, proposals for actions to develop education were made from the perspective of the selected competences and skills needs.

The anticipation group was motivated and even enthusiastic through the entire process. The atmosphere in the workshops was creative and positive. From beginning to end, the participation activity level was very high in comparison to similar processes in general. Three quarters of the people who volunteered for, were invited and appointed to the anticipation group took part in all of the workshops. This indicates the interest generated by the games industry. This is a question of a sector that offers new opportunities, is only now taking shape, currently creating its own basic infrastructure, and searching for its status in society.
2 The games industry operating environment

Background for the anticipation work was obtained by commissioning a background report, which was an operating environment analysis of the games industry situation in Finland. This report provided a brief description of the current state, education and NGOs in the sector and development projects in the sector in Finland. In addition, two sets of data were compiled for the background report, and tailored only for this report: an analysis of job announcements in the games industry (Foredata Oy) and a C&Q competences and skills needs analysis (Taina Hanhinen, C&Q Systems). The games industry operating environment is described in more detail in the unpublished background report for this project (Järvinen & Andolin, 2014).

The games industry is a growing new sector that does not have a traditional structure or a traditional infrastructure, either hard or soft. The practices and structures in the sector are only now being created. The workforce in the sector is made up of young people and the attrition due to retirement that is typical of other sectors does not exist. New, open jobs nearly in the games industry are nearly always the result of an increase in the number of jobs. Although the games industry has experienced a shortage of workforce and people have been recruited from abroad, the education offered in the sector and its content seems to correspond quite well to the competences and skills needs analyses at this time.

According to the competences and skills needs analyses (Foredata Oy and C&Q Systems), programming skills, especially object-oriented programming, continues to be the most important in the sector. However, at the same time, this is only a starting point for getting into the sector, a kind of minimum requirement. As the job field and companies grow, competences and skills needs very rapidly expand to include a broad understanding of topics such as metrics and game commercialisation for those who reach senior-level positions. A company must have competence related to collecting, managing and analysing user data. Employees must also be able to turn this analysis data into a practical game experience and, in the best case, a financial success. The competences and skills needs analyses also indicate a great need for 3D modelling. Of course, graphic designers are required to have 3D modelling competence but the same also applies to the actual game designers.

The majority of recruitment in the games industry takes place outside traditional job announcements in newspaper and official forums. Social media plays an important role. For example, LinkedIn, Facebook and Twitter contain a lot of games industry job announcements. Although the LinkedIn service in particular allows users to search for games industry job announcements by, for example, country and sector, it is difficult to produce reliable statistical data because games industry companies classify themselves in different ways with regard to sector.
2.1 The current state of the games industry

Companies and employers

Neogames’ list of companies includes 218 games industry (game development and publishing) companies. A total of 74 of these companies operate in at least 2 different focus areas, a few of them in up to 10. A total of 141 of the companies produce games or services for mobile devices, while 11 of the companies focus on console games and 36 on PC games. Other focus areas for game companies include health games, teaching games, betting games, game technology platforms, and online and browser-based games. New companies are founded at a fast pace in the games industry, and the majority of companies are very young.

Table 1. Organisation types in the Finnish games industry (Neogames).

<table>
<thead>
<tr>
<th>Organisation types</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Game development and publishing (the actual games industry)</td>
<td>218</td>
</tr>
<tr>
<td>Game consulting and other game-related expertise</td>
<td>38</td>
</tr>
<tr>
<td>Content production</td>
<td>18</td>
</tr>
<tr>
<td>Education</td>
<td>20</td>
</tr>
<tr>
<td>Regional games industry clusters</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>330</strong></td>
</tr>
</tbody>
</table>

Production value

Throughout the 21st century, the games industry has been the fastest growing branch of the entertainment business, with estimated worldwide sales reaching approximately 65 billion dollars (50 billion euros) in 2012. The success of the new game console generation is expected to increase sales in the sector to 105 billion dollars (80 million euros) by 2017. The annual growth rate (CAGR) for the games industry has accelerated in recent years. The first statistics available are for 2004, and during the first four years the annual growth rate averaged 21.4%, and by 2011 the average was 22.4%. When comparison was extended to 2013, the annual growth rate was already calculated at 39.5%.

In Finland, turnover in the games industry (game development and game services) was nearly 900 million euros in 2013 (Figure 2) in comparison to 250 million euros in 2012 (Neogames 2014, Vähäkainu et al. 2014). Based on data from 2004–2011, the Finnish Game Developers’ Association estimated that the combined turnover in the games industry would reach 1.5 billion euros by 2020. Some estimates expect growth to be significantly faster than this.
During the 21st century, the games industry in Finland has become an important part of the Finnish cultural export industry. More than 90% of Finnish games industry production is exported. Due to the small size of the domestic market, the games industry has been global activity right from the start. This sets high requirements for bodies operating in the games industry, for example, with regard to business competence.

**Employment**

The annual growth rate (CAGR) in people employed in the games industry was 11% for the years between 2004 and 2012. The number of people working in the games industry in the third quarter of 2013 was estimated to be more than 2,200. Growth has been rapid, as the games industry employed approximately 600 people in 2004 and an estimated 1,500 at the end of 2012.
Neogames has made calculations that combine the average annual growth in the games industry and information about the number of people employed at the end of 2012. This made it possible to estimate the number of people employed in the games industry 2020 (see Figure 3). In a second calculation based on the fastest growing micro-entrepreneurs, Neogames has estimated that the number of jobs in 2020 may be 8,500.

2.2 Education in the games industry and NGOs in Finland

Education

The games industry is young and workforce has not always been available in Finland. Workforce with the competences and skills needed in working life has also been recruited internationally. Game-related education and training has been offered in Finland for 10 years since the early 21st century. Only in recent years has the amount of education offered increased, and educational institutions have begun to invest more in education, for example, by developing degree programmes (Mononen et al. 2014). Game-related education and training is provided by 8 educational institutions at the upper secondary level, 12 polytechnics, and 8 universities. At this time, the education offered and its content appears to correspond quite well to the competences and skills needs that were identified in the competences and skills needs analyses for the background report that was compiled prior to the start of this anticipation work. The following list and map of education offered cannot be completely accurate. The broader the education and the higher the educational level involved, the more difficult it becomes to differentiate between game-related education and training and non-game-related education and training. In any case, it can be said that game-related education and training in Finland is quite broad-based in terms of content and geographically.
Universities that offer game-related education and training (blue squares on the map)

<table>
<thead>
<tr>
<th>City</th>
<th>University</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rovaniemi</td>
<td>University of Lapland</td>
<td>• Game-related education and training beginning</td>
</tr>
<tr>
<td>Oulu</td>
<td>University of Oulu</td>
<td>• Information Processing Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ludo Craft</td>
</tr>
<tr>
<td>Jyväskylä</td>
<td>University of Jyväskylä</td>
<td>• Degree programme in Information Technology</td>
</tr>
<tr>
<td>Tampere</td>
<td>University of Tampere</td>
<td>• Degree Programme in Information Studies and Interactive Media</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Game Research Lab</td>
</tr>
<tr>
<td>Lappeenranta</td>
<td>Lappeenranta University of Technology</td>
<td>• Information Technology education, Software Engineering education</td>
</tr>
<tr>
<td>Turku</td>
<td>University of Turku</td>
<td>• Degree Programme in Computer Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Degree programme in Information Technology</td>
</tr>
<tr>
<td>Helsinki</td>
<td>Aalto University</td>
<td>• Master’s Programme in New Media</td>
</tr>
<tr>
<td></td>
<td>University of Helsinki</td>
<td>• Computer Science: artificial intelligence, game production, game architecture, graphics, game programming, game development algorithms</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Gamics Laboratory</td>
</tr>
</tbody>
</table>

Polytechnics that offer game-related education and training (green circles on the map)

<table>
<thead>
<tr>
<th>City</th>
<th>University</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rovaniemi</td>
<td>Lapland University of Applied Sciences</td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td>Oulu</td>
<td>Oulu University of Applied Sciences (OAMK)</td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bachelor of Culture and Arts</td>
</tr>
<tr>
<td>Raahne</td>
<td>Oulu University of Applied Sciences (OAMK)</td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td>Kajaani</td>
<td>Kajaani University of Applied Sciences (KAMK)</td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td>Kokkola</td>
<td>Centria University of Applied Sciences</td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td>Kuopio</td>
<td>Savonia University of Applied Sciences</td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td>Joensuu</td>
<td>Karelia University of Applied Sciences</td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td>Jyväskylä</td>
<td>Jyväskylä University of Applied Sciences (JAMK)</td>
<td>• Bachelor of Engineering in Information and Communications Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td>Mikkeli</td>
<td>Mikkeli University of Applied Sciences (MAMK)</td>
<td>• Information processing, web development, big data, BBA</td>
</tr>
<tr>
<td>Tampere</td>
<td>Tampere University of Applied Sciences (TAMK)</td>
<td>• BBA in Information Processing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bachelor of Culture and Arts (Media and Arts)</td>
</tr>
</tbody>
</table>
Lahti University of Applied Sciences (LAMK) • Bachelor of Engineering in Information and Communications Technology
Kyymenlaakso University of Applied Sciences (KYAMK) • Bachelor of Culture and Arts
Turku University of Applied Sciences • Bachelor of Engineering in Information and Communications Technology
Metropolia University of Applied Sciences • Bachelor of Engineering in Information and Communications Technology

Upper secondary institutions that offer game-related education and training (red triangles on the map)

Rovaniemi Lapland Vocational College • Teaching content and units in game and 3D software field
Tornio Lappia Vocational College • Vocational Qualification in Information and Communication Technology, Datanomi
Oulu Oulu Vocational College • Vocational Qualification in Information and Communication Technology, Datanomi
Outokumpu North Karelia professional college • Vocational Qualification in Audiovisual Communication, Media Assistant
Kauhajoki Suupohja Vocational Institute • Datanomi, games industry
Nakkila Sataedu, Satakunta Educational Federation • Vocational Qualification in Audiovisual Communication, Media Assistant
Kouvola Kouvola Region Vocational College • Vocational Qualification in Information and Communication Technology, Datanomi
Vihti LUKSIA, Western Uusimaa Vocational College • Vocational Qualification in Information and Communication Technology, Datanomi

Folk high schools that offer game-related education and training or preparatory education (yellow stars on the map)

Otava Folk High School
Kauhajoki Evangelical College
Helsinki Evangelical College
Laajasalo opisto folk high school
Figure 4. Game-related education and training in Finland.
The following is a brief description of game-related education and training by educational level. More detailed information about institutions, study programmes and qualification structures is provided not only by the background report compiled for this anticipation process (Järvinen et al. / Foredata) but also by a report produced at the University of Jyväskylä: Mononen Laura, Neittaanmäki Pekka, Vähäkainu Petri (2014) Suomen pelialan koulutuksen kartoitus 2014 (A survey of game-related education and training in Finland 2014), Publications of the Faculty of Information Technology No. 19/2014. University of Jyväskylä.

**Content of game-related education and training at universities**

The game-related education and training provided at universities provides a theoretical, conceptual and cultural understanding of the games industry to support game design. Students work in multidisciplinary groups and expand their competence in game creation and in related areas, such as 3D animation, interactive storytelling and other fields, for example, entrepreneurship, more advanced programming, and economics and research.

**Content of game-related education and training at universities of applied sciences**

Game-related teaching at universities of applied sciences is implemented in, among others, information processing education, media education and ICT education. The graduates of these institutions have bachelor’s degrees in business administration, media and engineering. Some of the degrees are BCA Bachelor of Culture and Arts degrees.

Game-related education and training at universities of applied sciences provides a knowledge of games industry structures and methods and skills to understand the different areas and distribution channels in the games industry. It also provides skills for various programming needs, information networks, ICT project competence, and international business competence. Among others, the studies include game design, game development tools and languages, 2D and 3D graphics, animation and sound design. To an increasing extent, gamification is also tested in different services, such as health care and social services. In many cases, the studies are divided according to different game and development platforms: browser games, mobile games, as well as PC and console games.

**Content of game-related education and training at upper secondary institutions**

Game-related teaching at upper secondary institutions is part of either the audiovisual communications study programme and the vocational qualification in audiovisual communications or the software production study programme and the vocational qualification in information and communication technology. These institutions graduate media assistants and software production datanomis.

Students gain a diverse range of skills to work in game production, project management and design. Among others, these include scriptwriting for games and designing game levels. The educational content includes 2D and 3D applications and the development tools of companies operating in the games industry. Games are designed and implemented for computers and mobile devices. The education emphasises the fact that creating games is always group work that progresses by production stage. In addition to competence related to animation, photography, video recording, and sound design, good social skills and the ability to remain on schedule are important skills. The education also provides a good foundation for students interested in becoming an entrepreneur.
Other game-related education and training and educational content

Courses related to game creation at folk high schools introduce students to the game production process and its different stages, tasks and the required skills in large and small productions. In addition to game design, the studies familiarise the student with creating visual material and the principles of interaction between software and hardware as well as the use and application of device and program entities. The studies involve developing basic information and skills together with other lines of study in the arts.

For example, the University of Jyväskylä has also organised short game creation courses for children and young people each spring since 2009. The University of Tampere, on the other hand, has organised education for game experts as labour policy adult education. The primary target group is unemployed persons or those at risk of unemployment who have completed a university degree and worked in the ICT sector.

NGOs

The games industry in Finland is primarily organised under the umbrella of Neogames Finland. Neogames is a member-based, non-profit games industry association that supports the growth and development of the Finnish games industry as well as a sustainable operating environment that fosters growth. The members of Neogames are operators from all games industry sectors. Neogames organises and coordinates various games industry events and develops cooperation with the public and political sectors. In addition to other awareness activities, Neogames compiles reports that focus on the situation and prospects in the games industry.

The membership of Neogames includes individual members and Suomen pelikehittäjät ry, which represents game development companies in Finland. The organisation serves as the coordination body for Finnish game companies, promoting their activities and supervising their shared interests.

At the international level, Neogames is a founding member of the Nordic Game Institute (NGI) and the European Games Developer Federation (EGDF). Neogames Finland also cooperates closely with the International Game Developers Association (IGDA) Finland association. The mission of IGDA Finland is to support the career and professional skill development of individual game developers based in Finland by, for example, helping local developers meet other professionals and build networks by means of monthly meetings. In addition, IGDA Finland promotes and enhances the international visibility of the Finnish game developer community by, for example, facilitating the exchange of ideas and attracting international experts to Finland.

2.3 Games industry development projects in Finland

Games industry development projects have often focused on developing the content of education in the sector, facility, software and hardware acquisitions, and expert networking as well as improving the opportunities for games industry operations and development in general. Like most projects, games industry projects rarely function alone and separately. They involve a lot of mutual collaboration, and their activities and goals overlap, in terms of both time and content. In addition, games industry development projects are without exception networked with at least the corporate and corporate development field in their own operating area, and in many cases on a more extensive basis domestically and internationally.
Games industry development projects are most commonly financed by means of European Union Structural Fund money. In these cases, the implementers are usually institutions and development companies. Tekes funds company development projects and research activities in the games industry. In addition, projects that have obtained funding from other channels are in progress. The games industry has many projects that are either completed, in progress or planned. Compiling a more complete description of all the projects would have required more in-depth investigation than was possible for this report. More detailed information about the projects is contained in the preliminary report drawn up for this anticipation work (Järvinen & Andolin 2014).

### Projects financed by the Structural Funds

In total, the 2007–2013 programming period included more than 50 projects that were closely related to the games industry or more loosely related to the gamification theme. The number of projects targeting the actual games industry can be considered to have been or be a total of 22. The amount of public (ESF, ERDF and state) funding granted to projects that are closely linked to the games industry was 6.4 million euros, most of which has been utilised. Some of the projects are still in progress.

The core of ESF and ERDF projects that are more loosely connected to the games industry is the development of some other object or sector to which games or gamification can create a bond. These have included an examination of the music cluster, use of a game-like 3D virtual environment in Finnish language teaching for immigrants, utilising gamification in tourism marketing, and utilising game-like opportunities in the development and utilisation of well-being technology.

**Table 2. Games industry projects implemented during the 2007–2013 Structural Fund programming period.**

<table>
<thead>
<tr>
<th>Implementer</th>
<th>Project name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aalto University School of Business Small Business Center</td>
<td>Game is ON! – entrepreneurship and company service</td>
</tr>
<tr>
<td>Cursor Oy</td>
<td>Kaakon Peliklusteri (2 projects)</td>
</tr>
<tr>
<td>Cursor Oy, Kotka-Hamina Regional Development Company</td>
<td>ICT services producer networks</td>
</tr>
<tr>
<td>New Factory Ltd</td>
<td>Tampere Game Factory</td>
</tr>
<tr>
<td>New Factory Ltd, Pirkanmaa</td>
<td>Protomo, Lean method use in startups</td>
</tr>
<tr>
<td>Joensuu Science Park</td>
<td>Oasis Game Inc. assessment project</td>
</tr>
<tr>
<td>Joensuu Science Park</td>
<td>Development of working life-based competence in the games industry</td>
</tr>
<tr>
<td>Jyväskylä Educational Consortium</td>
<td>Game Bridge</td>
</tr>
<tr>
<td>Kajaani University of Applied Sciences Ltd</td>
<td>Innova - Centre for development and learning</td>
</tr>
<tr>
<td>City of Kajaani / Kajaani University of Applied Sciences</td>
<td>Simulation and game development laboratory</td>
</tr>
<tr>
<td>City of Kajaani / Kajaani University of Applied Sciences</td>
<td>Development of simulation and game technology and game business competence in Kainuu</td>
</tr>
<tr>
<td>City of Kajaani / Kajaani University of Applied Sciences Ltd</td>
<td>Kajak Game Studio – investment project</td>
</tr>
<tr>
<td>Kouvolan Innovation Oy</td>
<td>Quality system for game-related education and training</td>
</tr>
<tr>
<td>City of Kouvolan / Kouvolan Region Vocational College</td>
<td>Gameedu Development of game-related education and training</td>
</tr>
<tr>
<td>Organization</td>
<td>Project/Programme</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Kymenlaakso UAS, Metropolia, Turun UAS, Saimia UAS and LUT</td>
<td>Game Cluster – game laboratory</td>
</tr>
<tr>
<td>Oulu University of Applied Sciences Ltd</td>
<td>OGDA – Oulu Game Development Agenda</td>
</tr>
<tr>
<td>University of Oulu Department of Information Processing and Computing</td>
<td>Game Research Centre</td>
</tr>
<tr>
<td>University of Oulu Learning and Research Services</td>
<td>DiMeKe – Content development for digital media</td>
</tr>
<tr>
<td>North Karelia Municipal Education and Training Consortium</td>
<td>Content Mine, Game studio/incubator (2 projects)</td>
</tr>
<tr>
<td>Rovaniemi Municipal Federation of Education / Lapland Vocational College</td>
<td>3DLAPLAND – Game and 3D education development</td>
</tr>
<tr>
<td>Turku Science Park Ltd</td>
<td>VARMOL Mobile business development</td>
</tr>
</tbody>
</table>

More information about the projects funded by the European Union Structural Funds in 2007–2013 is available in the project information service: https://www.eura2007.fi/rtiepa
Very little monitoring information on 2014–2020 projects is likely to be available at this time. More information at: www.rakennerahastot.fi

**Other games industry development projects**

**Tekes – SKENE**

Tekes manages the SKENE – Games Refueled programme, which aims to strengthen Finland’s global position as a hotspot for the gaming and entertainment industry. In addition to funding, the programme offers matchmaking events, market surveys and networking with companies and operators in the industry. SKENE will continue until the end of 2015 and its scope is approximately 70 million euros, with Tekes’ share coming to some 30 million. The list of bodies that receive project funding through the programme is updated regularly on the Tekes website. The most recent situation can be viewed at: http://www.tekes.fi/ohjelmat-ja-palvelut/ohjelmat-ja-verkostot/skene/projektit/

Not all of the information about company projects funded by Tekes is public. However, the summaries classified as public provide a picture of the type of subjects that are being developed by means of Tekes funding. In general, the projects develop product commercialisation, company earnings models and marketing needs as well as the prerequisites for international growth. With regard to technology, development of next generation console games is part of many projects, as is the development of global multilayer and mobile platforms. A total of 58 company projects are currently funded, with 25 of these already completed and 33 still in progress (end of 2014).

In addition to company projects, Tekes funds game research within the scope of the SKENE programme. The combined value of the research funding is approximately 1.9 million euros. The research projects are still in progress (end of 2014).
Table 3. Games industry research projects funded by Tekes’ SKENE programme.

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Project name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aalto University Foundation and University of Tampere</td>
<td>Koukku – Sales psychology for games, game psychology for sales</td>
</tr>
<tr>
<td>Aalto University Foundation</td>
<td>Future Game Animation</td>
</tr>
<tr>
<td>University of Eastern Finland</td>
<td>Health ProPeli – Developing Finnish Games for Health business</td>
</tr>
<tr>
<td>City of Kajaani</td>
<td>ATHENE+ – Future game environment to make people move</td>
</tr>
<tr>
<td>Oulu University of Applied Sciences Ltd</td>
<td>GAME STARTER</td>
</tr>
<tr>
<td>Municipal Federation of Savonia University of Applied Sciences</td>
<td>Developing the Finnish Games for Health business</td>
</tr>
<tr>
<td>University of Tampere</td>
<td>Best Practices for Free-to-Play Game Services</td>
</tr>
<tr>
<td>University of Turku</td>
<td>Play for Reward</td>
</tr>
</tbody>
</table>

Other game projects

Not all of the game-related development and research projects can be presented here. An example of an ongoing project is OASIS: Playful Spaces for Learning and Collaboration at Work, which is funded by the Finnish Work Environment Fund and led by the University of Tampere’s Gamelab. The project involves developing and studying an operating model that supports a new style of playful and creative learning environment and sense of community by making games part of university research and teaching work.

The Ludification and Emergence of Playful Culture project funded by the Academy of Finland examines the expanding role and significance of games and playfulness in modern culture and society. The starting point for the study is visible forms of games in everyday life and the dissemination of playfulness outside its original purpose and the impacts caused by this trend. The development path can be described as the ludification of culture and society. The research project will produce an analysis of how games and ludification affect and become a part of modern culture and different areas of society in Finland, thus creating an understanding of the various styles and impacts of playfulness. The University of Turku, University of Tampere and University of Jyväskylä are involved in the research project.

Tekes funds the Gamified Solutions in Healthcare project, which studies and develops gamified solutions to assist elderly people living in their own homes. The project period is 2014–2015. Another project funded by Tekes is the Fast Wow Effects Boosting SME Business project (2015–2016), which is being implemented by Turku University of Applied Sciences in cooperation with Centria University of Applied Sciences. The main objective of the project is to utilise digital content in a new way and, among other things, to activate opportunities to utilise game technologies in different sectors.

In addition, many projects implemented in Finland have utilised and developed, for example, competence needed in the games industry in other sectors. Examples of these are the Tekes-funded MARIN: Mobile Augmented Reality Tool for Marine Industry project and two The Futuristic History projects, which developed, for example, the 3D rendering or
augmented reality commonly used in game development for use in other sectors. More games industry-related projects include the following:

- Pelinrakentaja – Building the game scene in Turku Developing the games industry brand, network and business Implementation: Turku Science Park. Funding: ELY Centre of Southwest Finland, Turku Region Development Centre (TSeK)
- Turku Game Lab. Implementation: Turku UAS and University of Turku Funding: The Federation of Finnish Technology Industries Centennial Foundation

2.4 Job announcements in the games industry and the competences and skills required in them

Job announcements in the games industry

The source material for the job announcement analysis comprised job announcements posted in the te-palvelut.fi, (former mol.fi) and oikotie.fi services between 1 January 2013–15 August 2014, and they were analysed by means of text mining methods. The material contained more than one million job announcements. A total of 344 announcements were selected for the background report. The selection was made by searching the job announcements for announcements by companies that are included on the Operators list maintained by Neogames, the hub of the Finnish games industry http://www.neogames.fi/tietoa-toimialasta/alan-toimijat/. The majority of the 344 job announcements were published by the following companies:

Rovio 90 announcements (26%)
Digital Chocolate 79 announcements (23%)
Remedy Entertainment 35 announcements (10%)

At this point, it should be noted that each year an increasing share of the people recruited in any industry takes place via routes other than the traditional newspaper and official channels. This applies to games industry companies in particular, which announce open jobs on their own websites, in social media, or by word of mouth in their own communities and networks.

When examined by occupation, most of the job announcements in the games industry targeted the occupation of designer, which, according to the Ministry of Employment and the Economy’s 2005 classification of occupations used in this work, also includes programmers. Designers work in various design tasks in the information technology sector, but games industry job announcements for the designer occupation were specifically looking for a programmer for concrete game creation. However, quite a large number of the jobs were somewhat more demanding senior-level positions.
Table 4. The most common occupations in games industry job announcements in the te-palvelut.fi and oikotie.fi services 1 January 2010–15 August 2014.

<table>
<thead>
<tr>
<th>Occupation (Ministry of Employment and the Economy 2005 classification)</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designers</td>
<td>169</td>
<td>49</td>
</tr>
<tr>
<td>Electronics, automation and information technology engineers and technicians</td>
<td>28</td>
<td>8</td>
</tr>
<tr>
<td>Information technology managers</td>
<td>22</td>
<td>6</td>
</tr>
<tr>
<td>Financial planners</td>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>Visual artists</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>Company managers</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>75</td>
<td>22</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>344</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

In practice, job announcements targeting visual artists were job announcements for graphic artists. The number of these job announcements appears somewhat smaller in the table, because a significant share of job announcements that required competence in graphic design were placed in the designer occupation. The announcements for company managers were particularly looking for financial experts. The games industry is looking for three types of people: information technology, content development and business experts.

**Competence sought in games industry job announcements**

In general, along with programming competence, games industry job announcements emphasised a user-centred approach and development of practical everyday activities on the basis of user feedback. It should also be noted that in practice the types of competence overlap, mix together and form combinations. For example, programming competence is also required on the graphic implementation side and nearly everyone working in the sector should have at least a basic understanding of databases.

**General competences and skills needs**

Regardless of the occupation, the job announcements strongly emphasised the fact that work takes place in teams, in which interaction and teamwork skills are important. Also mentioned were the hectic nature of the work, which increases the importance of multitasking skills and remaining on schedule. In addition, the importance of outstanding skills in the English language was stressed, especially in large companies in the industry.

**Programming competence**

Programming competences and skills needs emphasised a complete understanding and mastery of object-oriented programming. This was also required in many positions that did not involve actual programming work. The most important programming language was clearly C++, but depending on the company and especially on the game being created, other object-oriented programming languages (such as Java and C#) were also important. It can be said that a mastery of object-oriented programming languages is required basic competence in the industry. Other programming languages mentioned several times in job announcements were Javascript, HTML, Scala, Flex, Python, and LUA.

Other types of programming-related basic competence that were emphasised included documentation competence and competence related to game engines and frameworks.
Competence related to the Unity game engine was clearly highlighted in the announcements. Games implemented with Unity can target several platforms or operating systems. These announcements also highlight different internet browsers, Facebook as well as Windows, OS X, iOS, Android, PlayStation and Xbox. The job announcements clearly emphasised two operating systems more than others: the Apple's iOS mobile operating system and Google's Android mobile operating system.

Competences and skills needs related to cloud services, servers and databases were emphasised in some job announcements. The competences and skills needs in these are not usually specified, but on the database side competence in both SQL and NoSQL databases is often required. The job announcements clearly demonstrated that competences and skills needs in these three fields of competence are often linked. An important element in this was background systems to enable game activities and their development and maintenance.

Graphics competence
Graphics competence is very important in game programming and game development. This was also apparent in job announcements in the industry. Graphics competence was needed not only in graphic designer positions but also for other jobs in the games industry. As in the sector in general, graphic designers also need to be able to implement their designs by programming and, correspondingly, other games industry professionals also have to have a mastery of 2D and 3D graphics.

Metrics and testing
On the basis of job announcements, the games industry is very user-centred. Development of game programming, and also graphics, the user experience and interfaces, is driven very strongly by feedback collected from users. This is usually collected in the background without the user actually being aware of it. Game development is also constantly tested with users.

This is evident in competences and skills needs in many ways. The most important of these are management, mining and analysis of big data, and development needs caused by metrics to the programming code itself, which in practice means development needs for the game programmers. Information collected from users first has to be saved in a sensible manner. After this, competence in analysing big data is needed in combination with a knowledge of the games industry. The analysed data has to serve practical programming work and the company's business. This simultaneously requires a new type of competence from programmers, because game programming development information is obtained in this way on the basis of metrics data. At best, new versions of games are produced on a daily basis.

Financial competence
Jobs that require concrete financial competence are often related to managerial positions in companies, but games industry job announcements emphasised financial competence in a slightly different way than in other sectors. This may in part be due to the fact that in the games industry the price of an individual game or part of it cannot be determined on the basis of traditional cost accounting, in which a profit margin is calculated on top of fixed and variable costs. In the games industry, the marginal cost of a game or part of it is close to zero. In other words, it costs almost nothing for a game company to sell a single additional product or additional service. In contrast, the costs of game development
are high. Pricing has to cover these costs for the entire lifespan of the game. In addition, especially for mobile games, the price of a game or part of it is based on the user's own perception of the benefit gained and subsequently their desire to pay for the game or part of it. Depending on the user, the amount of money people are willing to pay for a game or part of it is based on many different factors, which can vary greatly depending on geographic location. Another common operating model is Free-2-Play, in which the user can play a game at no cost but those who want to progress faster and have better features have to pay for this speed and ease.

Games industry job announcements are seeking business competence, which is the games industry can be very different than in more traditional segments of business. The job announcements demonstrated that games industry companies are very aware of the importance of commercialising a game and the necessity of profitable business. This kind of competence is becoming increasingly sought after as the industry matures, develops and grows.

**Other competences and skills needs**

Competences and skills needs related to project management and team leadership were highlighted in several games industry positions. In addition, the ability to remain on budget, both financially and in terms of scheduling, was emphasised in these positions. These senior-level positions generally required extensive experience in the sector, a background in programming, project management competence, leadership qualities, and financial competence. The combination of competences and skills can in these cases be achieved over a long period of time, but the job announcements indicated that there is a great need for such skills in the industry.

**2.5 Games industry competences and skills in C&Q interviews**

Interviews of 19 games industry companies were selected from the C&Q Systems Oy database. These interviews asked about the companies’ personnel and competences and skills needs at the time of the interview and in the future. All in all, the interviews targeted 492 professionals working in games industry companies. C&Q Systems Oy’s own qualification classification system, which includes more than 10,000 different qualifications, was applied to analysis of the interviews and data. The competences and skills needs were divided as follows:

- Current competences and skills needs: Competences and skills needs currently required from employees in their daily work
- Future competences and skills needs: competences and skills needs that companies will particularly require in the future
- Essential additional competences and skills needs: prevailing competence deficits in companies at this time
- Competences and skills needs required from recruits: competences and skills needs emphasised at this time
- Competence gaps among recent graduates: competence gaps among new, recently recruited employees

This chapter presents the most important occupational distributions and competences and skills needs for companies and picks out some other competence and skills needs. The competences and skills needs from the C&Q interviews of game companies are presented in more detail in the actual background report publication (Järvinen & Andolin 2014).
Table 5. Occupational distribution among employees of the games industry companies interviewed by C&Q in relation to number of people expressed in order of magnitude (classification of occupations: Statistics Finland 2001).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Game Artist</td>
<td>102</td>
<td>14</td>
</tr>
<tr>
<td>Game Developer, Game Programmer</td>
<td>100</td>
<td>14</td>
</tr>
<tr>
<td>Game Designer</td>
<td>43</td>
<td>10</td>
</tr>
<tr>
<td>Game Tester</td>
<td>43</td>
<td>6</td>
</tr>
<tr>
<td>Client Programmer</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Artist</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>Producer</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Level Designer</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Server Programmer, Server Engineer, Server Developer</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Graphics Programmer</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>95</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>492</strong></td>
<td><strong>19</strong></td>
</tr>
</tbody>
</table>

The C&Q surveys asked about the occupations of game company personnel. Table 5 shows that the majority of company employees who responded to the survey work very concretely in game creation. In Statistics Finland’s classification of occupations (2001), the majority of occupations are in the information technology designers and programmers or visual artists (artists) occupational groups. In the table, only the producer occupation differs from this line, being mainly positioned in the upper management level of companies.

The survey also asked companies about their future labour needs and especially about which occupations they would be focused on. The responses showed that the greatest labour needs were in the game programmer occupation. As many as 14 companies reported the need to hire employees for this occupation and these companies estimated that they would need to hire a total of 26 people. Nine companies reported the need to hire game artists and these companies estimated that they would need to hire a total of 16 people. The recruiting needs in other occupations were less than 10 people.

**Current competences and skills needs:**

The 30 most commonly mentioned current competences and skills needs for the game companies interviewed are presented in Table 6. The estimate provided applied to a total of 392 people. The majority of competences and skills needs focus on concrete information processing-related competence. The competences and skills can be very roughly divided into competences and skills needs related to programming competence (Unity, C++, Java, C#, etc.), 2D and 3D modelling, graphics, and mobile operating systems (Windows Phone, iOS and Android). However, one particularly prominent need is related the Unity game development tool, which is required in 14 organisations and from more than 100 people. Also common is the need for competence in the C++ programming language, which is required in 9 organisations and from 100 people. In other competences and skills needs areas, the number of people required was less than 70. Measured at the organisa-
tional level, the most common competences and skills needs are, in addition to the need for Unity competence, Adobe Photoshop software user skills and competence related to 3D modelling. More than 10 organisations have these competences and skills needs.

Table 6. Current competences and skills needs among the interviewed companies in relation to number of people and expressed in order of magnitude.

<table>
<thead>
<tr>
<th>Competences and skills needs</th>
<th>Persons no.</th>
<th>Organisations no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence related to the Unity game development tool</td>
<td>106</td>
<td>14</td>
</tr>
<tr>
<td>Competence related to C++ game programming</td>
<td>100</td>
<td>9</td>
</tr>
<tr>
<td>Competence related to producing 2D graphics</td>
<td>68</td>
<td>5</td>
</tr>
<tr>
<td>Competence related to the Adobe Flash development environment</td>
<td>67</td>
<td>6</td>
</tr>
<tr>
<td>Competence related to level design</td>
<td>48</td>
<td>8</td>
</tr>
<tr>
<td>Competence related to the Windows Phone operating system</td>
<td>48</td>
<td>2</td>
</tr>
<tr>
<td>Competence related to C# game programming</td>
<td>47</td>
<td>6</td>
</tr>
<tr>
<td>Competence related to server programming, server system programming</td>
<td>45</td>
<td>2</td>
</tr>
<tr>
<td>Skills related to texture graphics for 3D models</td>
<td>43</td>
<td>8</td>
</tr>
<tr>
<td>Competence related to the Apple iOS operating system</td>
<td>42</td>
<td>3</td>
</tr>
<tr>
<td>Skills in using Autodesk 3ds Max</td>
<td>41</td>
<td>10</td>
</tr>
<tr>
<td>Competence related to the Symbian operating system</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Competence related to the Android operating system</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>Skills in using the Adobe PhotoShop software</td>
<td>38</td>
<td>13</td>
</tr>
<tr>
<td>Skills related to character design</td>
<td>35</td>
<td>6</td>
</tr>
<tr>
<td>The ability to use agile software work methods</td>
<td>33</td>
<td>7</td>
</tr>
<tr>
<td>Competence related to 3D modelling</td>
<td>31</td>
<td>12</td>
</tr>
<tr>
<td>Skills related to 2D animation, animated graphics competence</td>
<td>29</td>
<td>7</td>
</tr>
<tr>
<td>Competence related to the JavaScript programming language</td>
<td>27</td>
<td>4</td>
</tr>
<tr>
<td>Basic knowledge of object-oriented programming languages (for example, Java, C++, C#, Eiffel, Smaltalk)</td>
<td>27</td>
<td>3</td>
</tr>
<tr>
<td>Competence related to the Java programming language</td>
<td>26</td>
<td>6</td>
</tr>
<tr>
<td>Competence related to Actionscript game programming</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Skills related to concept illustration</td>
<td>24</td>
<td>9</td>
</tr>
<tr>
<td>Skills in using the Autodesk Maya 3D animation software</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>Competence related to the Bullet physics engine</td>
<td>23</td>
<td>2</td>
</tr>
<tr>
<td>Skills related to 3D animation</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>Skills in using the Zbrush sculpting and painting software</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>Competence related to vector graphics</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Competence related to the use of the Box2D physics engine</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>Competence related to concept design</td>
<td>20</td>
<td>1</td>
</tr>
</tbody>
</table>
Other competences and skills needs
The overall low number of respondents makes it difficult to analyse the other competences and skills needs of the companies that responded to the interviews. Furthermore, the numbers of people are reported incompletely.

Eleven games industry companies reported their future competences and skills needs. As is the case with current competences and skills needs, the future needs are for the most part concretely linked to programming competence (Unity, C++, Java, C#, etc.) or cloud services. Only six of the companies in the survey reported immediate needs for additional competences and skills. At this time, the ability to use the FLEX programming environment and 3D competence would appear to be the immediate need with regard to additional competence. The competences and skills needs among recruits seem to loosely observe the current competences and skills needs presented earlier. As is the case in many other sectors, competence deficiencies among graduates appear to be related to employability skills.
3 Drivers of change

The participants in the first workshop brainstormed the key future drivers of change for the games industry that initiate some chain of events or large, individual event during the time interval studied and provide a direction for development. The drivers of change were discussed and eliminated by putting them in order of importance on the basis of uncertainty and significance. Eventually, a list of the 20 most important drivers of change was compiled. Table 7 shows the five drivers of change with the most support. The other drivers of change only received one, two or a maximum of three votes.

Table 7. Key future drivers of change in the games industry.

<table>
<thead>
<tr>
<th>Driver of change</th>
<th>Number of votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology development or change</td>
<td>16</td>
</tr>
<tr>
<td>The breakthrough of serious games and gamification</td>
<td>15</td>
</tr>
<tr>
<td>Change in earnings logic and the lifespan of games</td>
<td>12</td>
</tr>
<tr>
<td>Development of game development tools and licenses</td>
<td>9</td>
</tr>
<tr>
<td>Creation of a Finnish game system</td>
<td>5</td>
</tr>
</tbody>
</table>

Participants had the chance to supplement the drivers of change identified at the first workshop by means of a feedback survey completed during the interval between the first and second workshop. In addition, the drivers of change were supplemented and discussed at the start of the second workshop. Finally, the key drivers of change in the games industry were considered to be the phenomena and issues that are described next.

Technology development or change

The accelerating development of technology is also the most significant future driver of change in the games industry. For example, development of material technologies and energy technologies is related to the future of the games industry. However, the most central sector of technology is information and communication technology. Its continuous development in many different segments presents a constant challenge to the game world. Process technology and computer processing power and other device technology are naturally at the heart of this. Software technology and other technology related to soft content also play a key role. However, companies, research institutions, educational institutions and all games industry operators most commonly have to monitor the progress in other areas of digitalisation, new social media applications, the development of cloud services global communication networks, the development of wireless presence and contact between people and between machines and devices, the possibilities provided by big data and open data, the development of artificial senses, robotics applications, construction of virtual reality, cyborg technology prospects, and the development of artificial intelligence. The list is endless. However, it is essential that all of the above-mentioned technology becomes more intelligent and self-directing as artificial intelligence develops.

Continuous monitoring and quick reaction are important in companies and also in education, research, and the public sector. Finland has traditionally been very good at adopt-
ing new technologies. It is important to maintain this ability and ensure that the costs of technology use do not rise too high in the future. Everyone should have the opportunity to use the latest technology. All in all, technology development is leading to a world in which every person is connected in real-time to other people and to the machines and devices in their living environment. Naturally, this will all have an impact on games industry business, gaming and games. At the same time, the game world will merge with human life and cause the gamification and ludification of the entire society.

**The breakthrough of serious games, ludification and gamification**

Until now, the games industry has provided entertainment and experiences. In the future, the game world will take a place in our daily life, as life digitalises, information and communication technology become increasingly human, image replaces text, and interaction accelerates. Life and society will become gamified and serious games will spread. The interface between technology and a person will take game-like and playful forms. Gamification will occur. In the future, playful forms will come to participating in and influencing activities in society. Gamification will be applied in learning. We may see teaching games, democracy games, election games, tax return games, rescue exercise games, or gardening games. Scientific problems or product development challenges may be solved via gamesourcing by getting people to play with the issue.

Gamification represents a possibility for companies, which will be provided with new business opportunities, and for society, public services, education, and culture. Society must be active in this matter and progress to effective utilisation of gamification. At this time, the development of serious games and gamification of society is proceeding slowly because companies feel that the market is small. Productisation of serious games has only progressed in the United States. If Finland could succeed in operating in a purposeful manner, the public sector could be active in terms of piloting. Finnish serious game companies could become leading operators in their sector and gain a foothold in the international market.

Global standards and certificates that would verify the game benefit in a scientifically reliable manner could be created in Finland. The Finnish serious games industry could develop a “comprehensive school” that could be distributed digitally and would also be widely implemented in other parts of the world. The same thing could happen in health and well-being services.

**Change in earnings logic and the lifespan of games**

The model for profitable and productive business has been changing in the games industry. Earnings models are becoming more diverse, the value network is expanding and more operators are entering the chain. Games and gaming have traditionally been subject to payment in advance, either on a one-time basis or time-bound manner. At this time, it is also common to make buying or playing the game free (free to play), but for companies to obtain income by selling additional rights, additional services or various auxiliary products. Product placement and advertising financing will probably increase. In the future, the flow of money may reverse, with gamers being paid to play. Professional gaming will increase and eSports will grow in popularity. Gamers will also be paid for bringing other players into the game.
At the same time, the lifespans of games have shortened – hits come and go. Earnings logic also affects the choice of distribution channels. Game companies have traditionally been made use of a separate distributor, but the spread of mobile games has made self-publication more common. Gaining visibility and access to the broadest possible distribution channel has also played a decisive role. In the future, earnings logics in the game business will seek new paths, which will lead to major challenges in terms of cost control, pricing, building a distribution network, collecting and analysing customer data, and defining a market strategy. The Finnish games industry can attract more investments and funding to the country in the future.

**Development of game development tools and licenses**

The development of game development tools to be more user-friendly, compatible and easier to use is part of the technology advance described above. In the future, more easy-to-use platforms, ready-made tools and tool libraries will be available for game development. The most routine level of game creation will become automated. Like many other areas of life, the do-it-yourself culture will also take over the game world. Anyone will be able to create games easily and at a reasonable cost. In the future, game creation will be served by a broader and more diverse range of education offered, in which the best tools available to everyone at a moderate cost and teaching staff is always up to date.

**Creation of a Finnish game system**

In the future, one opportunity for success in global competition could lie in the creation of a specialised Finnish game development ecosystem. Finnish game production would be branded to the outside world. Public operators would be actively involved in developing the game community and Finland would present itself as a single entity. The Finnish game community could be characterised by, for example, flexible, neutral adaptation to different cultural environments and different geographic markets. Monitoring of technology would also be arranged as systematic cooperation.

**Paradigm change in the entertainment industry**

Books, theatre, radio, film and television have been and are still offered to the audience on an “as is” basis. Companies began to turn these traditional culture products into computer games. Now games are replacing traditional tools. Rather than passively accepting what is offered, games allow people to actually participate in creating the experience. We are moving from a one-way to a two-way system.

Earlier, unidirectional culture or entertainment was an external product. Now, people go inside the games, live in and adapt them. Commitment to the game world is more fixed than with traditional culture products. People spend a lot more time with games than they do with traditional books or TV.

Rather than being only a mutual relationship between a game and a person, this is more and more often multilateral social participation by groups of people in the creation and maintenance of a game or some other experience-based product that takes place in information networks. Eventually, the new paradigm would not only be limited to games but would permeate all social interaction in information networks and virtual reality.

Gaming is becoming its very own multilevel world. Even now, a sub-culture is spreading in which one group of people plays while another group watches how the others play.
Electronic sports is growing alongside traditional sports. In eSports, the players compete in different sports and the audience follows the competition – but everything happens in an information network, in a cloud and on servers. Just like in the traditional sports world, the next stage of evolution will likely involve betting on what will happen in the actual competition.

**Increasing multiculturalism**

The rapid development of information and communication technology has globalised our life. Everything is international: business, working life, leisure time activities, and gaming. As a digital product, the games industry business is completely global in terms of its earnings logic and market. The gamer community is also international, tending to group itself more according to game platforms and game technologies than citizenship. The game world is simultaneously homogeneous and multicultural.

In the future, the gamer field will become even more multicultural and fragmented. Culture environments that have not traditionally been a part of western communities will become a part of the game world. In the future, games will have to diversify and provide different versions for different platforms and for different cultural localisations. On the other hand, there is more freedom in the virtual game world to redefine identity and make various ethical-aesthetic lifestyle choices. For example, the origin of physical reality is no longer defined by the cultural and social reality of the game world.

**Emphasis on the social importance of games**

Computer gaming used to be interaction between a single person and a machine. During the last decade, games have integrated with information networks and social communication systems (for example, Steam). Social networks are interwoven with games and interaction between people takes place via gaming. In the future, it may be difficult to differentiate between a game, social media interaction or life in virtual reality. New and socially important functionalities of augmented and gamified reality will probably provide opportunities for perceiving, identifying and interpreting social and emotional hints. The personal information and statistics of another person will be visible and phenomena that resemble telepathy will become more common.

There is also another side of the coin with regard to sociality. Sociality in the game world contains the same characteristics as human communities in modern industry. Bullying, racism, stereotypes and discrimination occur in social games. Not everyone is allowed to participate in a game and some people are left out. Social pressure to play the right games prevails in the communities. Just like in the real world, social problems in virtual reality also have to be dealt with.

**Tougher competition and globalisation of distribution channels**

Competition in the games industry will globalise and become even tougher. Markets in the game world will take on new forms. For example, more than one billion young adults under the age of 25 are growing up in Chindia (China+India). This is same as the total number of people in Europe, the USA and Australia. Huge markets are waiting in Africa. We can assume that more centralised, umbrella-like distribution systems will develop, and it will be vital for game companies to be part of these systems. Companies will cluster into groups and customers into families around them. On the other hand, it would be ideal if small companies also had the opportunity to develop and grow their business.
For small companies, the opportunities likely lie in innovation, specialisation or being local. Crowd sourcing, open development environments and microtasking may also provide small companies with the chance to integrate with the global game business. It is possible that, along with money, new tools for exchange may spread in the game world.

**Increased international and domestic regulation**

As globalisation and networking progress, various consortia will integrate to become increasingly large entities. This complexity will manifest itself as institutionalisation and an increase in contracts and regulations. The future may end up being ruled by lawyers. In the mosaic-like society of the future, the process of drawing up contracts will become more complicated internationally, domestically and between organisations. There will be more different viewpoints and parties, and long-term commitment will be difficult to achieve as the pace of change accelerates. The number of contracts will rise in an attempt to control an increasingly complex world.

As is the case with any new phenomenon, the game world has also been able to grow in a manner quite free of institutionalisation and regulation. However, like any other phenomenon that is becoming established and mainstream, the games industry will also encounter a future that contains more regulations, more decrees and laws, more contracts, and more different auxiliary institutions. It is possible that global games industry regulation and the rules of the actual games may come closer to each other or even merge to become the same set of rules.

The increase in regulation will complicate the activities of companies, especially small companies. Development in global markets will also be hampered by the small size of the Finnish games industry, because we have no possibility of setting legislation. In order for the Finnish games industry to be able to adapt to international markets as flexibly as possible, our own regulation should be enabling rather than limiting in nature.

Regulation may also be an opportunity in the future if Finland can be involved in defining the legislation and standards. An example of this is the GSM standards for mobile phones, which opened the doors to global markets for a small operator. It is of utmost importance to the Finnish games industry to be involved in the activities of international institutions in the industry.

**New forms of formal and informal education**

Self-motivated education structures have gained an increasingly strong position alongside formal institutional education. Companies use informal practices to train their personnel, and people are independently acquiring more competence, knowledge and skills directly from the internet. These formal and informal forms of learning are becoming more diverse. The education offered is globalising and education leading to a degree is will lose its position.

This theme can be divided in two from the perspective of the games industry. On the one hand, it involves utilising games in education, and on the other hand it concerns the education of game producers. The former is seen as a future growth direction in the games industry, in both formal institutional education and informal learning. The latter of these, game producer education, has been developed by a few pioneers in this new sector.
The competence of game creators has traditionally come from self-education, with institutional education only becoming more prevalent in recent years. Do-it-yourself learning is still common in the games industry, and it suits both the industry and the spirit of the times. Technology development moves so fast that informal, self-motivated informal education will continue to be common and desirable in the games industry in the future. Education in which one game developer teaches another and on-the-job learning are also useful paths in a young industry. In the future, self-motivated education may also be robotised as artificial intelligence becomes more common in information networks.

However, the games industry is maturing into an established and respected sector. In the next phase of evolution, the games industry must strengthen its formal education infrastructure to ensure a sufficient supply of competent workforce in terms of both quantity and quality. Vocational education and training must produce a workforce that has sufficient general skills and which is able to quickly adopt the latest technologies in a rapidly developing industry. The fast pace of change in game technologies means that research in the industry has to remain close to education.

**Growth in the importance of user data as part of game development**

Game development has traditionally been inventor-centred activity. Good games have been created by implementing the ideas of enthusiastic and dedicated people. This innovation model will probably continue to be part of the games industry in the future. However, since games are experience-based products, the experiences of the customers, or gamers, are very important. Information obtained from user experiences is particularly important when developing serious and service games. All in all, the compiling, analysis and utilisation of user data will play a significant role in the creation of user-centred innovations in the future. In the games industry, it is common for customers to participate in testing and even developing end products. Developers and customers could work together to create games in the future – this could even be called collaborative design.

Methods of collecting consumer-centred data, data mining, sensor technology, open big data analysis methods, crowd sourcing, and microtasking will be key segments and functions in the games industry in the future. Data markets, places where the big data collected is bought and sold, will continue to grow. This will especially apply to games industry growth in serious games, learning, health care and social services, and other public services. In order to avoid having the system backfire, open and honest negotiations must be held on the markets concerning the use and commercial utilisation of consumer data. The individual must have the opportunity to decide what information he or she hands over, at what price and for which purpose.

**Growth in the importance of data security**

The increasingly close connection between people and machines to the global information network makes it possible to collect data about people. When in an information network, we are exposed to various digital diseases, snooping by means of malware, or actual crime. All of this also applies to gaming. Game companies need anonymous user data to support their product development, but at the same time big data about gamers is collected and analysed for commercial purposes. Whenever data is collected, it can also be used for harmful or, from the individual's point of view, undesirable purposes. The importance of privacy protection and data security is increasing all the time. In the future, data security and privacy protection will become a central theme in an environment of
artificial intelligence, smart devices and smart information networks, and smart virtual reality. How can artificial intelligence be restricted in terms of its access to personal data? How can the individual protect his or her identity in a smart information network? The Finnish game community must strive to profile itself in a way that give us a reputation for developing and providing the world's more data secure products.
4 Scenarios

At the second workshop, the drivers of change were varied and described in the futures table (table 8) so that they formed different scenarios. The starting point was not completely open, and the purpose was to outline four types of scenarios.

1. Development continues in the present manner (Business as usual, BAU)
2. Desirable scenario, a time of strong growth or blossoming in the sector
3. Undesirable scenario, decline in the sector
4. Surprising, wild or startling scenario

Table 8. Drivers of change and scenarios in the games industry.

<table>
<thead>
<tr>
<th>Driver of change</th>
<th>SCENARIOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology development or change</td>
<td>Present (BAU)</td>
</tr>
<tr>
<td>Change in earnings logic and the lifespan of games</td>
<td>Desirable</td>
</tr>
<tr>
<td>Development of game development tools and licenses</td>
<td>Undesirable</td>
</tr>
<tr>
<td>Creation of a Finnish game system</td>
<td>Surprising</td>
</tr>
<tr>
<td>Paradigm change in the entertainment industry</td>
<td></td>
</tr>
<tr>
<td>Increasing multiculturalism</td>
<td></td>
</tr>
<tr>
<td>Emphasis on the social importance of games</td>
<td></td>
</tr>
<tr>
<td>Tougher competition and globalisation of distribution channels</td>
<td></td>
</tr>
<tr>
<td>Increased international and domestic regulation</td>
<td></td>
</tr>
<tr>
<td>New forms of formal and informal education</td>
<td></td>
</tr>
<tr>
<td>Growth in the importance of user data as part of game development</td>
<td></td>
</tr>
<tr>
<td>Growth in the importance of data security</td>
<td></td>
</tr>
</tbody>
</table>

Each of the four groups formed at the workshop represented one scenario. In this way, the four different scenarios were developed into preliminary stories and the scenarios were given names. The actual scenario descriptions will be presented later in this chapter. The first step involved creating customer types as building material for the scenarios. The scenarios were given the following names:

- Folks wagen – Business as usual (BAU)
- Export driver (Desirable scenario, time of strong growth / blossoming in the sector)
- Monopoly model – China buys Google (Undesirable scenario, decline in the sector)
- Games save the world (Surprising, wild, startling scenario)

Game customer types

In order to deepen and specify the scenarios, games industry customer types were brainstormed and their characteristics described by scenario. The customerships were embedded in the scenarios at the third workshop and the scenario stories defined in more detail at the same time. The scenario stories are presented at the end of this chapter as the anticipation groups wrote them.
The fourfold table applied to illustrating the customerships (see figures 5–9) was created based on the ideas of one of the working groups. However, indicative placement of the customerships in the table was handled by the authors of the report (with the exception of figure 9). The vertical axe (society-entertainment) can be seen to represent the dichotomy between entertainment games and serious games that characterises the entire report. This issue was already included in the definition before the anticipation process began. This problematic nature of this dichotomy has been identified many times during this process: beneficial can also be entertaining or entertaining can simultaneously be societal. The fourfold table figures shall serve as indicative tools for thinking.

**Mark Modifier**

Mark is an adult, employed game workshopper and add-on developer, a modifier. He spends a lot of time gaming and studies all possibilities. Mark wants the game to be broad and deep. He is active in terms of playing, but not very active with regard to society. Mark may have a company that produces content and game mechanics for different forms of society games.

**Henry Hedonist**

Heikki is an adult experience-seeking entertainment gamer, who plays both small and large games on an irregular basis. He may also be passionate about playing a certain type of game. Heikki is not interested in benefits or social impact, and recreation and competitions are important to him. He is also prepared to pay for this. A basic, casual gamer, 15–30 minutes per day, on the entertainment side, and plays when his friends play.

**Dennis Destructive**

Dennis is a troublemaker who tries to disturb the games of others and entertains himself by observing the reactions. He is an anarchist, who doesn't accept rules agreed on by others. His goal is to find the loopholes that can interfere with others' gaming and earn respect in his own group. He is competitive and likes new game mechanics. Dennis could be a system tester, hacker or watchdog who reveals problems in the game world.

**Anna Activist**

Anna is very aware of society and the desire to exert influence. She collaborates on many forums, in different roles and in different networks. Anna strives to develop games herself, but rather than being especially interested in pure entertainment she wants games to address themes of historical or social importance. It is important for the games to create better opportunities to exert influence.

**Robert Retiree**

Robert's gaming, especially social games, helps him deal with loneliness. Gaming also rehabilitates and helps him maintain his memory activity in particular.
Gary Gamer
Gary is 48 and he spends some money on games. He is particularly fond of sports games and his tool of choice is a PC.

Eric Employee
An employee who is responsible for the games industry and handles purchasing plays as part of his job. He studies and tests educational games (edugames).

Helen Housewife
Helen plays social media games, as a means of passing the time and sometimes for social relationships.

1 The indicative placement of customerships was done by the authors of the report. The vertical axle can be seen to represent the dichotomy between entertainment games and serious games that characterises the entire report. This dichotomy is problematic; beneficial can also be entertaining or entertaining can simultaneously be societal.
Petra Preschooler
Mother and father buy platform games for 6-year old Petra.

Tina Teenager
Tina plays on all platforms and is particularly fond of mobile games. Her gaming can be characterised by social interaction.

Four-year-old
Mainly plays with parents. The parents buy developmental and activating games. For example, early educational games are played to learn languages or mathematics and to detect learning difficulties (and even illnesses).

Eight-year-old pupil in Riyadh
The pupil from the 3rd district in Riyadh plays as part of learning and during leisure time. The societal purpose of gaming is the adoption of culturally acceptable learning content – playing at comprehensive school. One of the aims is to become familiar with different cultures or to detect learning difficulties. The pupil also plays in order to learn how to make games. On the other hand, playing is also a matter of passing time, socialness and competition. Decisions to purchase games are made by the parents and the education authorities.

Active adult gamer
An active 40-year-old entertainment and serious gamer spends a limited amount of time playing, possibly for short periods, several times a day. Plays in environments intended for playing and in others (such as Facebook). The motive is often escapism and recreation. A further aim may also be to maintain international networks or self-development by utilising software that contains gameful elements at work. The entertainment value in this player’s serious games is similar to that of traditional entertainment games. A social network has developed around the games and it may be a question of fulfilling childhood dreams again.

Global enterprise buyer
A professional buyer for an international company, who makes game purchase decisions according to business principles. This player has to increase the customer base of his or her company, develop its business and improve profitability. He or she wants to buy game products and services with the best possible price-quality ratio, and which are produced with, for example, the world’s best serious game competence.

Meilahti clinic customer
A 75-year-old senior living in an institution or at home maintains his or her functional capacity, prevents diseases and averts loneliness through gaming. The games provide activating entertainment and produce experiences.
Golden retriever

A golden retriever (8 years old) plays dog activity games in an urban living environment. Owner Hilda (73 years old) can’t provide her dog with enough exercise and buys games to ensure that the dog gets enough exercise and other activities. At the same time, Hilda is entertained by watching her dog play. Animal games are also useful in cases when an animal has to spend a lot of time alone in a home.

Learning professional

A professional who obtains knowledge and skills and practices or tests new things in a certain sector plays games in that sector. This type of game may, for example, be a simulator or virtual reality, in which a person can do things before they are possible in reality. Customer groups can be students, doctors, societal planners, engineers, forest machine operators, or nurses.

Game-playing candidate

Candidates in elections play political simulation games before the election. Citizens can follow the game event and make voting decisions. The citizens, or voters, can influence the content and problem-setting in the simulations.

Filipino nurse

A 25-year-old Filipino nurse who moved to Kainuu to ease the nursing shortage plays integration games that help her learn the Finnish language and integrate with society. The game also provides social contacts.

Table 9. Customer types in the games industry by scenario.

<table>
<thead>
<tr>
<th>Folks wagen</th>
<th>Export driver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden retriever</td>
<td>Four-year-old</td>
</tr>
<tr>
<td>Learning professional</td>
<td>Eight-year-old pupil in Riyadh</td>
</tr>
<tr>
<td>Game-playing candidate</td>
<td>Active adult gamer</td>
</tr>
<tr>
<td>Filipino nurse</td>
<td>Global enterprise buyer</td>
</tr>
<tr>
<td></td>
<td>Meilahti clinic customer</td>
</tr>
<tr>
<td>Monopoly model</td>
<td>Games save the world</td>
</tr>
<tr>
<td>Robert Retiree</td>
<td>Mark Modifier</td>
</tr>
<tr>
<td>Gary Gamer</td>
<td>Henry Hedonist</td>
</tr>
<tr>
<td>Eric Employee</td>
<td>Dennis Destructive</td>
</tr>
<tr>
<td>Helen Housewife</td>
<td>Anna Activist</td>
</tr>
<tr>
<td>Petra Preschooler</td>
<td></td>
</tr>
<tr>
<td>Tina Teenager</td>
<td></td>
</tr>
</tbody>
</table>
4.1 Folks wagen – Business as usual (BAU)

Digital technology is part of normal life in the late 2020s. Devices that enable digital gaming have developed strongly, and more of them are available. The game world is coming closer to people all the time. The rapid cycle of technology development continuously opens up opportunities for new game creators to enter the industry. Technology development leads to the strong gamification of matters in normal daily life. Games become a part of people's work and recreational life. Serious games are already part of people everyday lives.

Serious game production has established itself as part of the games industry. The number of applications grows steadily from 2025 onwards. The line between serious and entertainment games is blurred, and it is more difficult to differentiate between them. Normal sports activities have become more technology-oriented and every added technology element enables gamification. At job interviews, applicants have to perform a simulation related to the position in order to get a job. In the 2020s, an employee's sports activities and lifestyle has become gamified and they have a direct impact on job applications.

Game lifespans are broken down into small parts and game operators simultaneously have more ways to succeed in the industry. Value networks expand and operating models diversify, a good example of which is a model in which gamers are paid for playing. Game development tools develop so that it is easy for a person who has no technical skills to make games. The proliferation of crowd sourcing in game making continues. A Finnish game ecosystem has been created and established, and is expanding to include other sectors. Activities receive more support than easier, funding is available and the games industry has organised itself in a cluster-like manner.

In the entertainment industry, games will significantly increase their share in relation to other entertainment offered. The games industry will gain new markets and multiculturalism will increase at the same time. The games industry will localise products in a manner that makes it possible for new groups to play them. The social importance of games continues to increase in the late 2020s: the game world takes time and resources from other social interaction in society.
The games industry will pull in other sectors, becoming more heterogeneous as the number of customers and fragmentation in the industry grows. The games industry is constantly looking for new markets and active operations attract other operators. The formation of new distribution channels opens up opportunities for wider game distribution. Regulation will increase as the games industry establishes itself as a serious industry. Small operators in particular will find that this complicates their activities.

There will be a lot of game-related education and training available at the late 2020s. The games industry will also effectively utilise informal education methods in order to ensure a competent workforce. New tools have been developed to utilise customer, gamer, and market data and data mining is increasing. The amount of data will increase and data will be better utilised to develop business. Data will be bought and sold to a greater degree and data markets will grow. Risks and threats related to data security will increase, and the data security sector will gain new operators, who provide users and game developers with new opportunities in data security development.

Simulation and strategy gaming will become a part of societal activities. Company activities will be simulated in real time. Gamification will be used to illustrate choices in public sector preparations and policy decision-making.
4.2 Export driver (desirable)

The Finnish attitude towards new technology will be very positive at the end of the 2020s. Both the public and private sector will maintain and influence the technology friendliness of society through their own actions. Finnish games industry operators have become the leading pioneers in their industry. New technologies will be developed and companies, the public sector and citizens will have the skills needed to utilise them. Finland will already have developed breakthrough technologies that also have strong markets internationally.

Serious games will pass entertainment games.

In the serious games industry, Finns are pioneer in terms of developing and implementing products to improve well-being. The public sector supports development and actively pilots new serious games by offering operators internationally reliable references. It is easier for games industry companies to enter international markets and they move outside Finland much faster than a decade earlier. Finland is the country that creates global standards and certificates for games in which the benefits have been scientifically and reliably studied. We are an attractive country for international operators.

Figure 7. Game customerships in the Export driver scenario.

Increased use of serious games in the education sector has strengthened Finland’s Pisa brand. Support for utilising the game world in teaching and learning will already begin in childhood. Game accreditations and certificates will be so reliable that we will have created a comprehensive school that can be distributed digitally. This concept will also be implemented globally. The health and well-being sector will have specialised in, for
example, supporting the well-being and health of elderly people. Serious games will be part of treatment and caring plans. Other sectors will also have benefited from the opportunities provided by the games industry in their activities. This new tool will provide companies with a competitive edge, and they will have become leading operators in their own sectors. Companies will use serious games to train their employees and develop their activities. Games will also be utilised to increase productivity.

**Game development tools will maintain the competitive edge in the future as well.**

Finns will product leading game development tools. The best tools will also be available to hobbyists and public sector operators. It will be possible to borrow the tools from the library. The number of licenses will also have increased and they will be in demand. It will be possible to price the licenses so that, for example, schools can afford to purchase them. Finns will be able to utilise game development tools and the threshold to using them will be low. Teachers in particular always have competence in the latest tools, and they are quickly implemented in education and teaching.

**The Finnish game ecosystem is part of society as a whole.**

A game ecosystem has developed in Finland, in which the public sector cooperates with game communities. Development will be based on dialogue between operators, and Finland will be seen as a unified games industry driver, also internationally. The games industry will be a genuinely attractive industry, in which public and private resources will be utilised to achieve success. A national coordination group will function in the games industry, one which has sufficient resources and authority to promote the joint good of the industry. Activities are agile and able to quickly change form in order to remain ahead of development.

Companies have developed in Finland that are able to offer different brands to large, international operators. This also makes it possible to provide better service to existing global brands. Finnish brands are distinguished and recognised international entertainment industry brands. Good success provides the financial security and opportunity to develop and try new brands.

The games industry has established itself as an industry sector in which the products provide a continuous and stable income. New products do not take income away from earlier products and it is possible for different product generations to co-exist. Finnish operators actively develop new and alternative earnings models. For example, product placement and advertising provide additional financing to a growing extent. On the other hand, players are paid for gaming and for bringing new players to the game. Games industry funding is functional and both public and private financial elements are in use. Support for developing the sector is available flexibly, and the industry also has the competence and ability to obtain funding. The earnings logic utilises big data in an effort to create a flow of income. A good and stable funding situation enables the development of new and risky products and concepts.

The games industry and games, those intended for serious and entertainment use, are developed for global markets right from the start. Finnish game developers have succeeded in designing games that utilise cultural characteristics. Games are localised and personalised smoothly. Finnish society and our way of operating are also appealing to experts
from abroad, for example, people can manage here in English. This has made it easier to attract top experts to interesting and respected positions in the Finnish games industry.

The social meaning of gaming has increased in the areas of learning and competence development and entertainment use. Among others, games provide excluded groups with contacts that increase social well-being. Finnish game creators have managed to develop successful and leading global massive multiplayer games and dominate the markets in their own sectors. Our games are visible in the key distribution channels and competition is open and free. Legislation in the games industry has become global. Finns are actively involved in developing regulation. Lobbying in the games industry benefits the entire industry and national regulation does not reduce opportunities for domestic operators in the global operating field.

Our own education system can produce the high-level and up-to-date competence required by the games industry. Recognition of international degrees and competence also functions, and experts are free to move around in pursuit of interesting job opportunities. A continuing education system has also been created in the games industry and it works throughout the career, providing people with the chance to expand and deepen their competence in the games industry. Game-related education and training is considered appealing and it is widely offered at all different teaching levels and in working life. The acquisition of informal competence, for example, recreational activities, is also utilised. Education is planned and adapted for games industry needs in a flexible manner that makes it possible to react to development occurring in the games industry.

Real-time data is a resource for society and the games industry.

Information about players or serious game users is utilised extensively, and Finland has the highest quality research in the world in the data science sector. The industry is able to quickly and effectively put research into practice in different areas of activities. The public sector provides all its information as open data. For example, the nation’s health information can be utilised in game design and segmenting.

Attention is focused on data security and in the late 2020s everyone controls information about themselves. Data security operators are networked with game operators, and Finnish products have the best data security in the world.

4.3 Monopoly model – China buys Google (undesirable)

In 15 years, basic technology will be so affordable that it is available to everyone. However, it will not be possible to develop new high technology in Finland due to a shortage of competence and high costs. We have fallen behind in terms of developing and implementing technology. The technology and games industry has also made poor investments in the area of technology development. Games and tools related to gaming do not develop. Technology development is in the hands of a few large companies. All players use products from the same large companies.

Serious games have been developed but the actual assistance or support provided by them is questionable. Games have been created to be light and provide only recreation. Investments were not made in quality but in making a quick profit on the market. The game itself is more important than the benefit to society or an individual person. Our society becomes
characterised by inequality. There are also a certain number of people in the society who do not play at all and their social status is weak. People spend a lot of time in the game world and this has replaced social life in the real world. The activities of players and game creators are governed by a winner take all attitude, which leads to loss of diversity in game production and the entire industry. Only a few of the largest operators can keep up. Games are made at an accelerating pace, because they have a short lifespan. There is no room or demand for quality thinking and long-term development. We fail to take the steps that follow F2P (Free-To-Play). The games industry is also declining with regard to profit, and it does not attract new entrepreneurs or operators. Games do not earn enough money.

Inside Finland, the interfaces between different sectors are closed and game production is centralised around a small number of manufacturers. The industry cannot attract a sufficient number of experts, because the licenses aimed at education providers are too expensive. Society has limited its support for the games industry and the threat of its complete termination exists. Games and gaming are not an interesting topic in Finland and there is no public dialogue. Gaming is routine.

Since the actual games industry has stagnated, games are produced via the film industry. Finland has been left outside this production, and we cannot make the type of games that interest the film industry.

International markets are beyond our reach, because Finnish game creators are unable to adapt to the characteristics and starting points in other cultures. All in all, we live in a
society characterised by increased bullying and various types of discrimination, including misogyny and reinforcement of stereotypes. These same features are transferred to the game world. The game world is a tough place. Not everyone is accepted, and this causes social pressure and classification based on who is in and who is out of the game. Playing focuses on the games that are popular at any given time. Large companies define the terms of use. Those who cannot adapt to the terms of use are in practice excluded from society.

It is difficult to distribute games out into the world. Only the biggest operators succeed in the competition, and in practice distributors decide which games make it through their hands to sales. The market is controlled by large companies. It may even be possible for Google to buy countries. Increased regulation and protectionism complicate entrepreneurship in Finland, which is on the edge of the market, and entrepreneurship is not considered interesting.

Development of game-related competence has been neglected because the industry is not interesting in general. When education stagnates, there is no new competence entering the industry and it cannot renew. Tuition-based education is available, but only for those who can afford it. Inequality is also growing in this area. Degree completion is seen as a guarantee of competence and competence and experience gained through on-the-job learning or hobbies is not respected. Vocational development does not occur in working life. The entire education system is too rigid and bureaucratic to produce modern and quality competence for the labour market.

All of the data obtained about gamers is for sale and game data is used against the user. Games have become a distribution channel for malware. There is no more privacy. Users and players are put in a difficult position because they constantly have to think about what kind of data is being collected. The fun goes out of gaming. We are unable to utilise data analysis in game product and business development.

### 4.4 Games save the world (surprising)

In 2025, virtual reality and actual reality have merged together. Things perceived virtually are considered just as real as experiences in the physical world. Advanced and highly refined technology is also available. Among others, wearable technology allows users to perceive the physical world as augmented reality. Gamification has permeated all functions of society. Work, learning and leisure time are all governed by gameful reward systems and logics. The aim is to solve problems in the world by means of games that combine global benefits and experiences. People strive to constantly fix and improve reality by means of games.

The roles of gamer and citizen overlap and integrate with each other. Value formation, service provision, and societal decision-making take place in the game world. Public operators, companies, NGOs, and individual function on a common playing field. Artificial intelligence systems develop into part of the collective intelligence operating culture: producers, users and artificial intelligence systems produce various elements for broad, international projects and local ones.

The game ecosystem is strong. Its foundation is local and it works like a super-networked hub as part of the global game network. The game world is made up of entertainment and
benefits, experience simulations have been accepted as part of normal daily life. People have unlimited possibilities to redefine their own identities. Culture and social reality no longer define the origin of any person’s physical reality. Gamified reality provides new tools for various ethical-aesthetic lifestyle choices.

In the late 2020s, social interaction in the game world is just as real as that which happens in the real world. The new and socially significant functions of augmented and gamified reality offer, for example, new opportunities for sensing, identifying and processing social and emotional cues and other information. The personal information and statistics of another person will become visible and, for example, phenomena that resemble telepathy will become a normal part of daily life.

Figure 9. Game customerships in the Games save the world scenario.

The games industry is tendered and state operators and the third sector become parties in the competition along with players and developers. In the game society, there is competition for game participants and attention, which define the value and importance of the game in progress. The money economy is joined by many other different value units and instruments of exchange. The regulation created for the games industry simultaneously serves as the game rules. The games industry develops its own rules and thus specifies regulation at the domestic and international level.
Learning in a gamified society takes place in hybrid expert systems, where the traditional student and teacher roles are blended and various data stores and artificial intelligences provide support for the activities. The flow of data is optimal, barriers have been dismantled and lowered so that a playful information society is based on the highest possible level of transparency. Open and honest negotiations are held concerning the use and commercial utilisation of data, and the individual makes decisions concerning what data he or she hands over in return for service or other benefits. Identity theft and information crimes are taken extremely seriously in society. For example, the penalty for irresponsible behaviour, hacking, and vandalism can be exclusion from the game – participation in the game is no longer allowed!
5 Scenario-specific competences and skills

The anticipation group examined competences and skills needs by scenario. With regard to the Folks wagen and Games save the world scenarios, the team considered what kind of competence is needed in each scenario. In the Export driver scenario, an additional perspective on competence involved determining what kind of competence could enhance realisation of the desirable future. On the other hand, the competences and skills needs in the most negative Monopoly model scenario were considered from the angle of what kind of competence is needed in that type of world, and also what kind of competence is needed to avoid the undesirable future.

The following competences and skills needs were shared by two or more scenarios:
- Competences and skills related to data analytics
- Competences and skills related to a user-centred approach, consideration of usability in software production and programming, usability research
- Serious game and social game development competence
- Programming competence
- Competence in data security related to software technology and information systems
- Game design competence
- Entrepreneurial and business skills
- A command of representational and PR tasks, PR competences and skills
- Marketing skills, sales promotion competence
- A positive attitude towards internationality, an understanding of the multicultural world, multiculturalism competence
- Sales skills, commercial skills, sales techniques, competence related to sales work
- Product development skills

In addition, a strong element in the Folks wagen scenario was an understanding of financial profitability and earnings logics (monetisation). In the Games save the world scenario, artificial intelligence-assisted design competence and identifying special customer needs was also emphasised. If the games industry would be Finland’s Export driver, more investment would be needed in quality animation competence and mastering procurement procedures and processes in both the private and public sectors. In order to avoid a Monopoly world, we need to be capable of quick content production, the skills to sell data, and the ability to adapt the basic product or service idea for different target groups (target group scalability). Somewhat cynically, it was also acknowledged that if we are forced into the undesirable future with no visible escape route, we will, among other things, need reverse engineering skills related to program code.
6 Competences and skills needs by games industry area

In order to go deeper into the specification of competences and skills needs and take note of the different functional entities in the sector, the next step involved dividing the games industry into areas. The areas were

1. Content, content production
2. Biz = Business
3. Tech = Technology
4. Understanding of user and society

Then the anticipation group considered what kind of competence and skills needs existed in these areas in the different scenarios. The following step involved describing by area the competence and skills needs that were identified in at least three different scenarios.

The competences and skills are classified into main categories, which will also be used later in this report. The categorisation is based on the dynamic competence qualification classification used in the C&Q competence management system. The classification serves different sectors and is hierarchical in nature, containing levels under each main category. The classification is also being supplemented continuously. (Hanhinen 2010)² The main competence categories used in the classification are

- Non-sector-specific general knowledge and skills related to production
- Competence in product and service production
- Business skills, administration and finance skills
- Mastering customerships and customer relationships
- Work organisation skills
- Personal skills and attitudes
- Research and development competence
- Scientific and other competences and skills

Throughout the anticipation process, the group produced freely-worded competences and skills needs, which were subsequently converted into competences and skills in line with the C&Q system and grouped by main category.

6.1 Competences and skills required in content production

In the future, more competence will be needed in handling company social relations and in interaction taking place in social media and face-to-face (competence related to community management). Other non-sector-specific general knowledge and skills needed in the future include competence related to 3D printing technology.

Graphic design, 2D graphic production, and 3D modelling and use of 3D graphics programs are some of the skills in the competence in product and service production main category that will also be needed in the future. More effort will have to be put into taking a user-centred approach and usability into account in programming production, as well as game interactivity, and these areas will require more competence. Gamification and competence related to planning gamification will grow in importance as gamification development in society progresses. Competence related to collaborative content production will be even more important in the future. Competence in interface design will continue to be necessary, with a focus on, for example, the ability to use 3D and 4D interfaces and competence related to augmented reality technology. Competence related to wearable games will be a new competence need in the future. It will also be useful for content production professionals to be able to develop and program various development tools.

A command of production and production chains requires comprehensive competences and skills. Storytelling skills, scriptwriting skills and skills related to audiovisual narration and audiovisual technology will be essential in terms of content production. Music composition skills and competence related to sound production will also be needed. Animation implementation skills will retain their importance in the future. One new field of competence that may be needed is that of avatar designer. A basic knowledge of psychology as it applies to game worlds will support performance of content production-related assignments.

Business skills, administration and finance skills will be even more important in the future with regard to identifying a company’s competitive factors and strengths.

Teamwork skills and the ability to share personal competence and expertise will be important personal skills and attitudes.

Visual design skills, the ability to create a visual look and artistic design skills are areas of research and development competence that will also be needed in the future.

6.2 Competences and skills needs in business

In the future, non-sector-specific general knowledge and skills in the business area will continue to require interaction and communication skills and an understanding of the possibilities for utilising social media. Project competence, project work skills, and project leadership competence (including project management and supervision) will also continue to be important. Skills in using simulation programs will be useful. Ethical competence, professional ethics and compliance with ethical values associated with the work as well as ethical assessment skills will become very important, perhaps even as completely new requirements.

In the future, competence in product and service production will emphasise a knowledge of copyrights, product protection and copyright law (IPR). Knowledge about own intellectual property rights and the skills to utilise these in product development and business on a global basis will be needed. The importance of data analytics competence will increase. Metrics design competence related to software technology will continue to be needed in the future, as will competence related to analytics and metrics tools in software production. Management of game communities will be an important field of
competence. In addition, business will require competence associated with production and production chain organisation.

Along with general financial competence, business skills, administration and finance skills will emphasise a knowledge of different financing possibilities and financing tools as well as the ability to acquire financing. In addition to operative everyday management skills, competence related to personnel administration and employment relationship matters will become an important area. There will be more need for competence related to an international operating environment and knowledge of international legislation in the sector in question. The need for procurement competence and subcontracting competence will grow and a knowledge of the procedures and processes associated with public procurement will be necessary. Competence related to combining the competence that exists in organisations and companies and which is a requirement for a networked operating method will clearly be more important than at present.

With regard to competence associated with mastering customerships and customer relationships, there will be a stronger emphasis on marketing skills and sales promotion and sales competence. Competence related to the implementing, completing and managing advertising and marketing campaigns will be required. To a certain extent, product placement competence, the importance of which will grow, will also be a part of this. There will be a lot of demand for competence related to social relations management, as will be the case with other types of diverse PR competences and skills. The focus will be on finding new potential customers (prospecting competence) and since potential customers can be found in any sector competence related to market development and trend monitoring will become an important competence need. A deep understanding of the customer's needs will be essential.

With regard to work organisation skills, a different type of competence associated with leading a creative organisation and, in particular, recognising and identifying the characteristics of personnel management in creative organisations will be emphasised. Operating in networks and coordinating and managing networks will be future competences and skills needs. An important element of personal skills and attitudes will be an interest in continuously maintaining and developing personal knowledge related to business and finance matters.

Research and development competence will naturally play a big role in the games industry. Product design and brainstorming skills will be needed, in other words, competence associated with product idea development. People must be able to turn business ideas into activity and refine and productise existing ideas and products. Competence related to target group scalability, which is the ability to adapt the basic idea of a product or service for different target groups, will be increasingly important in the future, as will profiling and focusing on specific strengths. It will also be important to be able to read and utilise weak signals and be open to surprising viewpoints. These can be used to find niches in the market and utilise specialised competence in them. In terms of scientific competence, the sector will need more competence related to game culture research in the future.
6.3 Competences and skills needs in the technology area

Quality steering and monitoring are non-sector-specific general knowledge and skills that will increase in importance in the games industry technology area in the future. Experts in the industry will also have to be capable of continuously monitoring technology development and understanding the opportunities that it offers. With regard to project competence, competence related to new types of agile project tools and development methods and their utilisation will be emphasised. New competences and skills needs will be competence related to sensor and detector technology and the skills to use simulation programs.

Competence related to game technology and game design and programming will naturally be a key part of competence in product and service production in the games industry in the future. Competence related to intelligent experience-based environments for games and augmented reality technology will be required to an increasing extent. The need for competence associated with 2D graphic production will continue.

Awareness and competence related to understanding and utilising matters associated with the meaningfulness and functionality of gaming and the playability of a game will continue to be important in the future. Technology professionals will also have to be able to evaluate features related to game usability and have a comprehensive knowledge of data security issues.

Also needed will be competence related to embedded systems, data analytics skills, as well as the ability to understand and utilise wearable technologies and virtual reality in game development. Experts will have to be able to manage software projects. The need for understanding social interaction will be further emphasised for those working with multiplayer games. In the future, competence related to developing serious games will also be very important in the technology area.

Competence related to software architecture, programming technology, programming languages and tools will be essential in the technology area. Other competences and skills needs that will retain their importance in the future are back-end and front-end programming skills and competence related to analytics and metrics tools in software production. Gadget design and programming skills will continue to be important in the future. The ability to utilise information system interfaces in programming work will be necessary. Competence will also be needed in server maintenance management, such as installation, commissioning and maintenance. Professionals will have to understand data security matters, some of them in a very in-depth manner.

In the future, robotics will be utilised in game development, so competence in that area will also be required. One example of a competence need that will continue to be important in the future is competence related to various development tools and the skills to use them. One reason for this is the fact that gamification as a phenomenon will become more significant, and in the future new skills will be needed with regard to utilising physiological events, such as eye movements, heart beats, voice (voice control), and touch technology, in game development.

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3 Programming of software operating on the server side (back-end) and programming that the browser interprets and which produces some property in the interface that is visible to the user (front-end).

4 Miniature applications or plug-in programs that can be installed, for example, on web pages or in different interfaces.
With regard to business skills and customership competence, the emphasis will be placed on entrepreneurial skills and customer knowledge, and understanding the users of products and services. It will be necessary to understand the company’s earnings logic and the opportunities for finding new earnings logics.

The areas of research and development competence and scientific competence that will be emphasised in the future include technology innovation and competence related to developing new technologies and competence in the neurology sector. For example, the latter competence will be needed when developing various serious games to support rehabilitation activities. The development of serious games to meet different needs will also require the business sector to have competence that crosses the interfaces between different sectors.

### 6.4 Competences and skills needs in the understanding of user and society area

In this area, the required non-sector-specific general knowledge and skills include quality competence (quality steering, assurance, supervision, monitoring, etc.) and an understanding of social media utilisation and the opportunities it offers in terms of use. Community management, handling the social relations between a company and the surrounding society and different operators, requires competence related to using social media and other channels and face-to-face communications. Professionals need to have a good general knowledge of society and must understand the systems and regulation in society.

With regard to competence in product and service production, the analysis and utilisation of big data will be emphasised. This is required to when identifying customer needs, emotions and feelings, and for utilising this data in product development and business because a deep understanding of customer needs is a key success factor. Competence related to implementing usability research is important, as is operating between the game company and players, player guidance, coaching, etc. More competence regarding the interactivity of games will be needed. Professionals must have competence related to different testing methods and tools and analytics and metrics tools for software production. In order to develop serious games, it must be possible to collect data from customers and society and utilise it.

Skills in developing relationships and networking and competence related to internalising a partnership mentality and managing stakeholder relations will be key business skills, administration and finance skills in the future.

Competence related to handling societal relations and other PR competences and skills (community management) will be required in the area of mastering customerships and customer relationships. Service mindedness, customer service skills and identifying the customer’s service level and need will be emphasised. Performing market research and compiling market reports (corporate, product, customer, market analyses) will also be important in the future. The significance of cultural knowledge and multicultural competence will increase.

In terms of research and development competence and scientific competence, more competence related to multidisciplinary research will be needed, and this competence need will be strongly emphasised in the industry. There will be demand for competence related to human sciences and cognitive sciences in the games industry.
7 Competences and skills needs for different professional groups in the games industry

After specifying the scenario-specific and area-specific future competences and skills needs, the anticipation group focused on considering the future professional groups and their competences and skills needs. With regard to the games industry areas presented in chapter 6, the team stated that there are some key professional groups that will also be retained in the future. The positions or professional groups that will be retained are presented in table 10.

Table 10. Professional groups or positions that will be retained in the games industry.

<table>
<thead>
<tr>
<th>Games industry area</th>
<th>Professional groups or positions that will be retained in the area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>scriptwriter, game designer, graphic designer, producer, sound designer, composer, game programmer</td>
</tr>
<tr>
<td>Biz</td>
<td>marketing, administration, financial management, project management, human resource management, communications</td>
</tr>
<tr>
<td>Tech</td>
<td>back-end and front-end/programming, expert, administrator, data security expert, tool development, quality assurance (designers), equipment competence</td>
</tr>
<tr>
<td>Understanding of user and society</td>
<td>analyst, community manager, testers, big data experts</td>
</tr>
</tbody>
</table>

For the most part, the current competence requirements will remain the same in these basic tasks, in addition to which new focuses will arise from the competences and skills needs mentioned in chapters 5 and 6.

The anticipation group defined the following new professional groups in the games industry:

1. Player psychologist
   A game psychology professional, understands players and concentrates on designing, developing and maintaining the interactive relationships related to games and gamification. Identifies player needs, fulfils them and possibly also creates needs.

2. Domain expert, including technology
   Functions as an interface coordinator, helps build games for new areas. May be an expert in another sector who has strong competence in the games industry or a games industry expert who has strong competence in another sector. Is able to big data analysis.

3. Ethics advisor & law
   Understands the law and follows changes in legislation, an expert in ethics

4. Human to human:
   - Personal trainer
     A ‘sparring partner’, teaches people how to play, in online in contact with the customer, assists the “socially awkward” in the game world, helps in the game world (curator, support and security), a hired game partner.
• Community manager
  A community manager, handles relationships between the game company and the surrounding society. Determines the needs of customers (also society).

5. Trend forecaster
  Understands trends and weak signals and monitors their development, a game culture expert, user researcher. A trend forecaster has competence related to big data and analytics, follows game communities and activities extensively in different sectors, and produces summarised and analysed data to support product development.

Future competences and skills needs were considered for the four professional groups mentioned first (new professional groups 1–4). The following table presents the competences and skills that the anticipation work found to be emphasised as key competences and skills needs for these new professional groups.
<table>
<thead>
<tr>
<th>Main competence category</th>
<th>Player psychologist</th>
<th>Domain expert</th>
<th>Ethics advisor &amp; law</th>
<th>Community manager</th>
<th>Personal trainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-sector-specific general knowledge and skills related to production</td>
<td>• Quality steering, quality assurance, quality control, monitoring competence</td>
<td>• Understanding the opportunities provided by technology and development</td>
<td>• Ethical competence, professional ethics and observing the ethical values of work</td>
<td>• Interaction and communication skills</td>
<td>• Interaction and communication skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Competence related to sensor, detector technology</td>
<td>• Understanding social responsibility</td>
<td>• Understanding of the possibilities for utilising and use of social media.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Skills to use simulation programs</td>
<td>• Competence related to ethics research</td>
<td></td>
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<td></td>
<td>• Ethical competence, professional ethics and observing the ethical values of work</td>
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<tr>
<td>Competence in product and service production</td>
<td>• Identifying and dealing with players in the game community who have mental health problems</td>
<td>• Competence related to programming technology, programming language and tools</td>
<td>• Knowledge of the Act on Audiovisual Programmes</td>
<td>• Communication competence in game communities</td>
<td>• Competences and skills related to gamification, design of gamification</td>
</tr>
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<td></td>
<td>• Competence related to game harassment and game ethics in digital games</td>
<td>• Competences and skills related to game technology, game design and programming</td>
<td>• Competence related to internal game judgement systems</td>
<td>• Competences and skills related to gamification, design of gamification</td>
<td>• Competences and skills related to serious game development</td>
</tr>
<tr>
<td></td>
<td>• The skills to detect and deal with bullying and hate speech occurring in a game community</td>
<td>• Utilisation of physiological phenomena in game development, such as eye movement detection, using heart rate-based data, competence related to touch ID technology and its utilisation in game development</td>
<td>• Competence related to finance laws in the game world</td>
<td>• Competences and skills related to building game communities</td>
<td>• Operating between a game company and players, player steering, coaching, etc.</td>
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<td></td>
<td>• Developing physically safe game technology (for example, does not cause eye irritation or nausea)</td>
<td>• Programming and development skills for development tools</td>
<td>• Knowledge of copyrights, product protection and copyright law</td>
<td>• Identifies different kinds of harassment and inappropriate activity online</td>
<td>• Competences and skills related to game interactivity</td>
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<td></td>
<td>• Utilising data compiled about customers to customise games</td>
<td>• Gadget design and programming skills</td>
<td>• Knowledge of the requirements that various statutes and norms set for game age limits</td>
<td>• • •</td>
<td>• Competence related to occupational therapy</td>
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<td></td>
<td>• Knowledge related to optometry, optics and visual observation</td>
<td></td>
<td>• Competence related to game harassment and game ethics in digital games</td>
<td></td>
<td>• A command of bidirectional interaction and its utilisation</td>
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<td></td>
<td>• Knowledge related to diseases of old age and their impacts on functional capacity</td>
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<tr>
<td>Main competence category</td>
<td>Player psychologist</td>
<td>Domain expert</td>
<td>Ethics advisor &amp; law</td>
<td>Community manager</td>
<td>Personal trainer</td>
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</tbody>
</table>
|                         | • Knowledge of mental health problems  
• Competence related to handling addicted players  
• Competence related to perceiving addiction formation  
• Understanding addiction formation  
• Competence related to the psychology of perception  
• Competence related to motivation psychology  
• Knowledge of group behaviour  
• Knowledge of group formation mechanisms  
• Knowledge and understanding of the psychology of special groups  
• Competence related to punishment practices in digital games  
• Knowledge of the Consumer Protection Act |
|                         | • Knowledge of international taxation, tax legislation  
• International contract law competence |
|                         | • Competences and skills related to an international operating environment  
• Skills in establishing relationships and networking, internalising a partnership mentality |
|                         | • Ability and desire for renewal  
• Knowledge of public procurement procedure for the seller viewpoint  
• Knowledge of public procurement procedure for the buyer viewpoint |
| Mastering customerships and customer relationships | • Understanding user motivation  
• Performing market research, compiling market reports (corporate, product, customer, market analyses)  
• Competence related to customer segmenting  
• Customer segment analysis using compiled data  
• Mastering customerships and customer relationships  
• Handling representational tasks, PR tasks, PR competences and skills Skills to represent the company's product  
• Service mindedness, customer service skills  
• Cultural knowledge, multiculturalism competence  
• Addressing a customer's special requirements and individual needs  
• Customer knowledge, understanding product and service users  
• Understanding user motivation |
<table>
<thead>
<tr>
<th>Main competence category</th>
<th>Player psychologist</th>
<th>Domain expert</th>
<th>Ethics advisor &amp; law</th>
<th>Community manager</th>
<th>Personal trainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work organisation skills</td>
<td>• Team work skills</td>
<td>• Team work skills</td>
<td>• Team work skills</td>
<td>• Team work skills</td>
<td>• Team work skills</td>
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<tr>
<td>Personal skills and attitudes</td>
<td>• Knowledge of factors affecting emotions and pleasure</td>
<td>• Keeping up with technical development, adopting new technologies</td>
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<tr>
<td>Research and development competence and scientific and other competence</td>
<td>• Competences and skills related to target group scalability, the ability to adapt the basic idea of a product or service for different target groups</td>
<td>• Competence related to technology innovation, new technology development</td>
<td>• Competence related to productisation, turning a business idea into profitable activity</td>
<td>• Innovation competences and skills, innovating competences and skills</td>
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</tr>
</tbody>
</table>
8 Future competences and skills needs in the games industry

When the material produced by the anticipation group was examined as a whole so that the probable and positive scenario and the competences and skills required by different areas and occupations in the games industry are taken into consideration, cross-cutting competences and skills needs in the industry can be found, both in a future that is the result of steady development and in the desirable future. With regard to the desirable future, we can also think that this is a matter of competences and skills that will facilitate achievement of that future, because this was one of the viewpoints when the anticipation group defined the competences and skills needs for the scenario. Table 12 presents the competences and skills needs for the games industry in the future.

Table 12. Cross cutting competences and skills needs in the games industry.

<table>
<thead>
<tr>
<th>Main competence category</th>
<th>Competences and skills needs</th>
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</table>
| Non-sector-specific general knowledge and skills | • Interaction and communication skills  
• Understanding of the possibilities for utilising and use of social media  
• Competences and skills related to community management, handling a company’s social relationships  
• Understanding the opportunities provided by technology and development  
• Skills to use simulation programs  
• Quality responsibility, quality control of work, quality thinking, quality awareness  
• Ethical competence |
| Competence in product and service production | • Competence related to the use of 3D graphics programs  
• Competence related to data analytics, big data utilisation competence  
• Understanding of wearable technologies and their utilisation in game development  
• Taking a user-centred approach, usability into account in programming production  
• Competences and skills related to gamification, design of gamification  
• Competences and skills related to building game communities  
• Competences and skills related to serious game development  
• Competence related to analytics and metrics tools in software production  
• Understanding of data security and data protection matters  
• Competences and skills related to game technology, game design and programming  
• Competences and skills related to augmented reality technology, combining real and virtual objects  
• Competences and skills related to game interactivity  
• Competences and skills related to game design  
• Programming and development skills for development tools  
• Animation implementation skills |
| Business skills, administration and finance skills | • Competences and skills related to an international operating environment  
• Skills in establishing relationships and networking, internalising a new kind of partnership mentality  
• The ability to handle representational and PR tasks, PR competences and skills |
| Mastering customerships and customer relationships | • Cultural knowledge, multiculturalism competence  
• Sales skills, commercial skills, sales techniques, competence related to sales work, marketing competence |
| Work organisation skills | • Team work skills, also in an online community |
| Personal skills and attitudes | • Keeping up with technical development, adopting new technology  
• Open-mindedness |
| Research and development competence and scientific and other competence | • Competences and skills related to productisation, turning a business idea into profitable activity, “branding” competence  
• Competences and skills related to target group scalability, the ability to adapt the basic idea of a product or service for different target groups  
• Innovation competences and skills, innovating competences and skills |

The anticipation group selected the following of these as rising and in part new competences and skills needs that will increase in importance in the future:

- Competences and skills related to community management, handling a company’s social relationships
- Competences and skills related to productisation, turning a business idea into productive activity, sales and marketing competence, branding competence
- Competences and skills related to target group scalability, the ability to adapt the basic idea of a product or service for different target groups
- Ethical competence, professional ethics and observing the ethical values of work
- Data analytics competences and skills, big data utilisation competences and skills
- Competences and skills related to new technologies, now, for example, competences and skills related to wearable games, competence related to sensor and detector technology and augmented reality (technologies develop rapidly, which requires continuous monitoring of development)
- Competences and skills related to gamification, design of gamification
- Competences and skills related to serious games, with teaching and education and well-being and health serving as good examples
- Skills in establishing relationships and networking, internalising a partnership mentality
- Cultural knowledge, multiculturalism competence
- Team work skills, competence related to agile development methods in projects, creative organisational leadership skills, competence related to new forms of cooperation
9 Proposals for developing education

At the end of the anticipation process, the team considered proposals for developing education. The starting point for this discussion was the new professional groups for the games industry that were presented in the previous chapter. The new job descriptions of the future (player psychologist, domain expert, etc.) were seen to link game design and games industry competence to other sectors in a new way. According to the anticipation group, the need for the new job descriptions in question may be long-lasting or very short-term. This is difficult to forecast and as a result the team did not consider it sensible to develop very detailed education pathways. On the other hand, it is more sensible to add and retain the modularity of education – a student in sector X (for example, economics, psychology, information processing) could include a module or minor in game design or ludoliteracy in his or her studies. In addition, studies in different sectors would be included in actual game-related degrees and qualifications in the most diverse manner possible. Instead of actual courses, this could be implemented in a lighter manner as individual guest lectures and game jam and hackathon-style events that bring students and professionals from different sectors together.

The development proposals below are divided according to the combined fields of competence. To a certain extent, the division is artificial, because the same development proposal may belong under several headings.

Information processing

- It will be ensured that studies include exercises and assignments related to utilising big data and the application of data analytics.
- All educational levels should teach data collection and analysis skills as well as critical and logical thinking skills. This would already be facilitated by already reinforcing basic civics skills, such as mathematics (including mental arithmetic) in comprehensive school.
- Students will be included more strongly in renewing and developing educational content.

Multidisciplinarity, team work skills, networking competence, interface competence

- Collisions between students from different sectors are important. This can be supported by organising game jam and hackathon-style events. This requires support from education providers and additional resources.
- Studies that cross the boundaries of different sectors should be favoured. It should also be possible to select studies from other education levels. It will be ensured that the education system enables a smooth move from one sector to another.
- More project study among students from different sectors. Projects and other multidisciplinary studies require assignments or simulated situations in which the learner has to explain to experts from other sectors why, from the perspective of his or her competence, issue X should be done in manner Y.

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5 Community events, where experts from different sectors who are interested in games and gaming meet and carry out game development projects.
Cooperation between institutions must be increased (also between different educational levels). For example, this can be supported by means of virtual teaching.

**A positive attitude towards internationality, multiculturalism**

- Teaching aimed at achieving cultural knowledge should be added to education.
- More international cooperation, for example, via student and teacher exchanges and international projects.
- Language teaching should be strengthened: basic skills in English in vocational education and training, and presentation in English and text production and communication skills in, for example, Chinese, French and Spanish in higher education. It is also important to take languages in developing markets into account.

**Customer competence, communication and marketing skills**

- The education should include real customer projects and subcontracting projects.
- Teaching in written communication should be increased. For example, it would be good to know how to write publication texts and product development meeting memos.
- Teaching in sales and marketing skills will be added.
- More teaching is needed in the use and utilisation of social media. Students should know how to utilise social media (critically) in, for example, marketing.
- Students should learn how to test prototypes produced in the projects on the market.
- More presentation skills teaching is required in the education. Among other things, students should learn how to give a sales speech (and an elevator pitch). Partly related to this is the need to teach company and product representation.

**Legal and ethical competence**

- Vocational education and training needs units that orient and familiarise students with the law and ethics-related units that are integrated with other teaching.
- Higher education needs more teaching related to copyright legislation and international norms as they related to games (such as EU directives, the American and Asian regulation systems).
- At least in higher education, students should become familiar with game supervision, their internal regulations and laws and judgement systems.
- Studies should include knowledge of the principle for assigning age limits to games.
- Game-specific legal studies should also be offered at the university level.
- More teaching is needed about social responsibility, also regarding serious games. Serious game developers should understand the norms in the sector for which the game is being developed (for example, health care and Act on the Status and Rights of Patients).
- Teaching in ethics should be increased.

**Research and development competence**

- More psychological theory and research should be added to game-related education and training. This would promote the competence in the area of utilising user data when doing user research. It would also contribute to ensuring better utilisation of motivational psychology theories in game development.
- Behavioural sciences and consumer research should be utilised to a greater extent in game-related studies.
An awareness of the added value that creativity research brings to the games industry.

More education is needed in game-related law.

More effort should be put into game harassment ethics and research.

Students should be offered teaching in innovation methods.

Innovation competence could be increased by, for example, implementing projects and exercises in which students have to make several prototypes quickly.

A culture of open innovation should be favoured, one that includes companies, the public sector, the third sector and various associations and similar organisations. This would especially promote development competence related to serious games.

Students should also be familiarised with user-centred innovation (co-design).

Joint research, development and innovation activities involving institutions and companies will be increased.

In addition

Gamification skills can be learned through serious game projects.

In order to learn serious game development, students should become familiar with existing serious games and brainstorm and implement real serious games during their studies.

The aim of education should be competence, not a degree or qualification. The funding system should also make this possible.

The games industry needs more productisation and branding competence. This would be facilitated if education funding models provided more support for research, development and innovation activities and the development of product concept entities.

People should be aware of the importance of informal learning and provide space, encourage and offer opportunities for this by, for example, providing physical spaces for club activities, arranging various events, visits, etc. Informal learning should also be supported by boldly inventing completely new practices for it.

Interaction between companies and education organisations should be increased and new, different operating models created between them. Work placement is not enough as a cooperation model. Providing credit for work experience is one way of approaching the corporate and institutional world.

Education and teaching should be encouraging, and should allow for experimentation and mistakes.

The umbrella organisation for the Finnish games industry Neogames Finland’s goals for the term beginning in spring 2015 are in many ways consistent with the proposals made by the anticipation group. Among other things, Neogames proposes that since game creation is a combination of graphic, technical and business competence, it must be possible to build curricula in vocational education and training in sufficiently loose manner so that it is possible to combine study programmes into a consistent game-related education and training, both within an institution and when moving from one educational level to another. In order to safeguard working life skills, students should, along with their studies, spend sufficient time (for example, during the last year of studies) creating games published on the market in practice studio conditions corresponding to those at a company.

6 See Chapter 2.2.

With regard to higher education, Neogames proposes that graphic sector, game design, programming, and business students should implement joint game projects from the very start of their studies. Education organisations should also support students' independent hobby activities related to game culture and student-centred business activity. (Neogames 2015.) These proposals also support the anticipation group’s views concerning the need for more multidisciplinary experts, company cooperation and working life orientation as well as the importance of informal learning and study habits with regard to competence in the industry.
Sources


Description of the anticipation model created in the VOSE project (2013).

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Appendix 1 Anticipation group for competences and skills needs in the games industry

Representative of National Education and Training Committee for the Mechanical and Metal Industry:
Hannu Saarikangas Union of Professional Engineers in Finland (IL)

Representatives of the National Education and Training Committee for the Rehabilitation and Sports Sector:
Juhani Laurinkari University of Eastern Finland/Kuopio campus
Aleksi Valta Finnish Sports Institutes

Representative of the National Education and Training Committee for Visual Arts:
Juha Suonpää Tampere University of Applied Sciences

Representative of the National Education and Training Committee for the Music, Theatre and Dance Sector
Ville Sandqvist Universities Finland UNIFI, University of the Arts Helsinki

Representative of the National Education and Training Committee for the Education and Guidance Sector
Inkeri Toikka Trade Union of Education in Finland OAJ

Representatives of the National Education and Training Committee for the Electrical, Electronics and Information Technology Sector
Minna Jokinen The Federation of Finnish Technology Industries
Lauri Kurvonen Trade Union of Education in Finland OAJ
Juhani Nokela Academic Engineers and Architects in Finland TEK
Esko Pöllänen Savonia University of Applied Sciences
Tuula Sivonen The Federation of Finnish Technology Industries / Oulu

Representative of the National Education and Training Committee for the Crafts and Design Sector:
Kirsi Herala The Art and Cultural Professionals’ Trade Union TAKU ry

Representatives of the National Education and Training Committee for the Computing Sector:
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Jukka Heikkilä University of Turku
Juuso Huttunen Rovio Entertainment Oy
Tapio Kattainen OAJ/Helsinki Business College
Jukka Lehtonen OAJ/Helsinki Business College
Karri Lybeck Trade Union Pro
Hannu Saarikangas Union of Professional Engineers in Finland (IL)
Representatives of the National Education and Training Committee for the Communications Sector:
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Kristian Simolin Metropolia University of Applied Sciences

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Petri Hannula Lapland University of Applied Sciences
Teemu Hiilinen The Finnish eSports Federation (SEUL)
Koopee Hiltunen Neogames Finland Association
Perttu Hämäläinen Aalto University
Esa Jalonen Finland's Slot Machine Association (RAY)
Satu Kantola Tekes Skene – Games Refueled Programme
Tiina Karvonon Oulu Vocational College OSAO
Jaana-Maija Koivisto Metropolia University of Applied Sciences
Kari Korhonen Tekes Skene – Games Refueled Programme
Annakaisa Kultima University of Tampere
Antti Laiho Metropolia University of Applied Sciences
Mika Lammi Neogames Finland Association
Mika Luimula Turku University of Applied Sciences
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