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A Template For Building Adaptable Project Risk Management Games

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***Abstract*—This paper presents a prototype for a risk project management game template (PrimaGate). The template was developed in order to offer instructors and learners a flexible tool to build or adapt project risk management games that could be included as part of the curriculum to teach project management. The core focus of the design was to create a learning environment that facilitates the involvement and engagement of learners and provides learners with a sound understanding of the complexity of the project risk management process as well as providing students with the necessary knowledge and skills to identify, assess, mitigate, and follow up project risks. The template also provides instructors with greater flexibility to specify the challenge level of the game and to adjust it according to the learner's level of competence.**

Keywords—: project risk management; game-based learning; learning; PrimaGate; Adabtable game

I. INTRODUCTION

The use of games in teaching project risk management can be justified by the unique characteristics of the skills needed in order to perform the risk management process. Project risk management is a people-centered process. In other words, people involved in a project form their own subjective perceptions of risk based on their understanding of the context, their expectations, former experience, biases, and heuristics [1]. Using gaming therefore facilitates the inclusion of these human factors either during the game design or during the game simulation. Lectures, assignments, and case studies, do not help students develop an understanding of the kinds of people-centered problems involved in identifying, assessing, planning, and monitoring risks. Developing an understanding of these processes therefore requires different types of instructional methods. Taran [2] questioned the effectiveness of lecture-based teaching in providing students with sufficient confidence and ability to apply risk management concepts, and pointed out major shortcomings: 1) Lectures do not provide the possibility to experiment with the material being taught. Specific exercises and activities help, but these do not provide an entire "project picture". 2) It is difficult to provide students with a way of experiencing scenarios of following or ignoring risk management practices. Second, decision making during the risk management process is largely based on qualitative evaluation, and is strongly dependent on the project's context. Therefore there is no unique set of measures that can be used to respond to potential threats. Reading or thinking about the risk management process is, therefore, not enough [3]. It is a process that must be experienced, reflected upon, and guided through feedback and debriefing. Learning from games brings results due to 1) contextual information embedded in the dynamics of the game, 2) the organic process generated by the game, and 3) the risks, benefits, costs, outcomes, and rewards of the alternative strategies that result from decision making [4].

Reviewing the current literature on simulation games in project management shows that we can distinguish broadly between two categories of games: 1) Functional games: These are mainly *gamified* exercises that deal with isolated concepts (single or multiple.) Decision making in these kinds of games is based on mathematical models whice are mainly applied in order to balance or trade-off between multiple project objectives such as cost, time, performance, and so on. These kinds of simulation games also include experiential exercises (epigrammatic) for well-defined problems such as forecasting project duration, resource usage and levelling, cost estimation, cash flow control, and logical relations between project activities. This class of games is reported in, for example, [5-10]. 2) Project leadership simulation games: This category covers simulation of the issues arising at the leadership level of project management, for example, those concerning identification and selection of project execution strategy, selection of project organization structure and contract strategy [11, 12]. Although these games provide valuable learning experience and show the potential of using games in learning, we believe that they exhibit the following features:

- Most of the games reported or the commercially available games are rigid in the sense that instructors have little or no possibility to change or adapt the game parameters in order to control the events or to modify the game to suit the skill level or type of experience of the learners.

- The learner's sole role in these games is to play. Results reported previously by the author suggest [13, 14] that learning could be enhanced if learners were given the opportunity to contribute to the process or to events embedded in the game. This contribution to the game development or to the gameplay creates more ownership of the events in the game and this in turn increases the player's motivation and engagement.
- Another shortcoming in the reported games is that each game is relevant to only one type of industry or business application, for example construction, IT, or organizational development. Usually, playing these games requires a good understanding of that type of business in order to be able to relate the game events and the decision making to one's own situation. Therefore, a degree of relevance of the game is also important in order to establish and maintain interest in the game. It is very important to consider this factor especially when developing games for students of continuing education.
- The games reported require lots of time to play and lots of time to comprehend the game play or to understand the interface. All of these factors act to the disadvantage of the learning process and hinder the state of flow. Kiili [15] argues that all cognitive resources should be used to learn rather than to handle complexity of the game or the artifact. They warn that the complexity of the task and the use of the artifact may detract from the user's attention. This would ultimately result in poor usability, which in turn results in the player sacrificing attention and other cognitive resources to inappropriate activity.

A. *Paper objectives*

This paper contributes to the literature on game-based learning for teaching project management and reports the results of a development project that was initiated in order to build a user-friendly project risk management game template PrimaGate. The template has several functions that provide the game developer with the opportunity to address the above-mentioned shortcomings [16]. The current version provides the game developer with significant control over game variables, risks, and impact of the risks as well as control over measures to mitigate these risks.

The purpose of the game is to promote understanding of the project risk management processes and their relation to other project planning processes, as well as providing learners with the opportunity to experience the consequences of ignoring or following recommended project risk management practices.

II. DESCRIPTION OF THE TEMPLATE

First, let us point out the core architecture that is shared by all of the games that could be developed by PrimaGate. This includes:

- Every game built by the template is shown to the players through an Activity on Node (AON) network diagram. Each node in this network represents a work package in the project. The dependency between these work packages is restricted to finish to start dependency (in the current version of the template).
- The players represent (a project manager) working in a fictional company. This company represents the parent organization for the project manager. This company could be a construction company, a contractor, a software developer, a project management consultancy firm or any other. The type of business of the company is left to the game developer to decide depending on the scope and the context of the game and the type of risks intended to be shown.
- There is also an imaginary customer in the game. This customer could be an external customer who needs the expertise of the company in order to produce a product, service, or result within a specified time frame and according to the agreed specifications. The customer could also be an internal customer (internal department) who needs the expertise of the project manager to deliver a service, product, or result. The nature of the customer is also left to the game developer to decide. The ambition level of satisfying this customer is one of the parameters that could be controlled in the game design.
- The type of agreement between the customer and the company is based on the fixed sum plus material principle. This means that the customer pays a fixed amount of money to cover labor costs, overheads, equipment, and risk reduction. In addition to this fixed sum, the customer also covers any cost of materials used to produce the product that the customer will be billed for separately at the end of the project. The project budget therefore contains only the fixed sum.
- Project management success in each game is measured by three success criteria; 1) delivering the project on time, 2) keeping the expenses within specified budget, and 3) satisfying the customer.
- There are three levels for evaluating the final results of the game. Excellent: for players who satisfy all success criteria; Good: for players who satisfy at least two success criteria; and Poor: for players who manage to satisfy only one criterion or less.

A. *Characteristics of PrimaGate*

With the core architecture of the game established, the template offers the game developer full control over the challenge level in the game by controlling the following design parameters:

- The size of the project in terms of the number of work packages needed to deliver the product, service, or results;
- The workload of each work package in person-hours;

- Project budget and duration;
- Duration of the game in minutes;
- The number of persons that are available to the project and can be accessed by players to complete the different tasks;
- The number of persons (extra resources) that can be used if there is a need to expedite the project or to hurry up a work package. This group of resources resembles the costs needed to crash a project;
- The hourly-rate of each type of resource used;
- The effective number of working hours of the resources used;
- The number of risk factors that the players have to assess in each work package. Evidently, the higher the number of risks the more challenging the game in light of limited financial and human resources available;
- The probability and consequences of each risk factor on project duration, man-hours, project budget, and client satisfaction;
- The costs of mitigating these risk factors for each work package in terms of time needed, financial resources, and client satisfaction;
- Allowing the game developer to give a comprehensive description of the project, game play, and expected results, credit the contributors to the game and define the final evaluation text to be displayed to the players.

B. Building a Game using PrimaGate

Establishing a game using the PrimaGate template is accomplished through calling three built-in dialog boxes on the administrator page. These dialog boxes are:

Add A Game: This dialog box is used to establish a project game and to define its global variables. This includes: game title, game duration in minutes, project duration in days, budget, number of resources that could be accessed, number of risks displayed during simulation, hourly rate, threshold for customer satisfaction, project description, instructions for how to play the game, and acknowledgments. Add a game dialog box is shown in Table I. We have also provided an explanatory text for each parameter.

TABLE I. ADD A GAME DIALOG BOX

SELECT A TITLE FOR YOUR GAME
Select a title for your risk game, for example: Task Rotation Project
SELECT THE NUMBER OF RISKS TO BE SHOWN DURING SIMULATION
O1 O 2 O 3 O4 O 5 O 6 O 7 *Select the number of risks that you want to show to the players during the simulation. The game randomly selects risks from the risk database each time a player starts a game. The default value for the number of risks displayed is 3.*
BUDGET FOR THE PROJECT
Specify a budget for the project. This is a fixed sum that the players will have at their disposal during the simulation. If the players fail to deliver the project within this budget, the parent company will cover the deficit and the players will still be able to complete the project. The budget could be of any currency.
GAME DURATION IN MINUTES
Specify the game duration in minutes. Recommended duration is 60 minutes for a project that has around 15 work packages
PENALTY FOR EXCEEDING GAME DURATION PER MINUTE
Specify the amount of money that should be paid by the project for exceeding game duration. This amount will then be discounted from the project budget.
PROJECT DURATION IN DAYS
Specify project duration in days, default value is 0.
PENALTY FOR EXCEEDING GAME DURATION PER DAY
Specify the amount of money that should be paid for exceeding game duration per day. This amount will be discounted from the project budget. Default value is 0
NUMBER OF PERSONS AVAILABLE DURING SIMULATION (FIRST CATEGORY)
Specify the number of persons that the players will normally be able to access from the parent company during this project. This category of workforce will get paid a normal rate per hour.
THE HOURLY RATE FOR THIS CLASS OF RESOURCES
Specify the amount of money that will be paid to each person in this category per hour.
NUMBER OF EXTRA PERSONS AVAILABLE DURING SIMULATION (SECOND CATEGORY)
Specify the number of additional persons that the players can access during this project in order to expedite a delayed work-package or reach a deadline.
THE HOURLY RATE FOR THIS CLASS OF RESOURCES
Specify the amount of money that will be paid to each person in this category per hour.
WORKING HOURS PER DAY
Specify the amount of working hours per day for each person of both categories in the project.
CUSTOMER SATISFACTION
Specify the targeted level of customer satisfaction. This could be any value from 0–100. Default value is 75.
PROJECT DESCRIPTION
Provide a summary of the project. Information about goal and objectives, the customer, and other stakeholders. Provide information about the context, location of the project, or any other information that is significant in order to be able to define or assess risks such as information about competence of your workforce, or availability of equipment, or level of support or resistance.
GAME CREDITS
This slot could be used to list the names of people who have contributed to defining the scope of the game, defining risks, and possible mitigation strategies, costs associated with the risks, or their impact.
RESULTS: EXCELLENT
Formulate a text that will be displayed for the players who complete the project and satisfy ALL success criteria.
RESULTS: GOOD
Formulate a text that will be displayed for players who

complete the game successfully and satisfy at least TWO project success criteria.
RESULTS: POOR
Formulate a text that will be displayed for players who complete the game but satisfy only one or none of the project success criteria.
GAMEPLAY
Describe the game play of the project. This could include a description of what the players need to do to perform the simulation.
RULES OF THE GAME
Summarize all the rules of the game. Number of persons available, game duration, number of workers available, and so on.

Add A Work Package: This dialog box, shown in Table II, is used to build the network diagram of the project. This is the second level of game development. The aim is to construct a network diagram in the form of an Activity on Node (AON) diagram. The diagram will then be displayed to the players during the simulation. Information specified in the box includes, label, work package number, maximum allowed number of persons, predecessor, workload in man hours and the location of the work package along the horizontal axes (X-coordinate). There is no limit on the number of work packages but the minimum number is one. This dialog box should be called for every work package in the project.

TABLE II. ADD A WORK PACKAGE DIALOG BOX

GAME ID
Use this slot to specify the game identification number. This number could be seen on the left next to each game established; write the Game ID that you want to add work packages to.
WORK PACKAGE NUMBER IN THE GAME
Specify the work package number of each work package; this should enable the game developer to identify project risks for each work package using the work package identification number.
WORK PACKAGE LABEL
Specify a label for the work package; the name should be a short string of maximum 12 digits
DESCRIPTION
This slot is used to describe the work package; here the developer could provide information about the type of work context complexity, expectations, and so on.
MAXIUM ALLOWED NUMBER OF WORKERS PER DAY
This slot is used to specify the maximum number of persons that could actually be used in the given work package. The default value is "empty" meaning that the maximum number of persons allowed is equal to the maximum number available for your project (sum of normal and expedited resources). This restriction is sometimes useful in order to replicate situations where there are limits on the number of persons that could be used simultaneously because of, for example, lack of space or because of the type of task.
WORKLOAD IN HOURS
Specify the workload in hours for each work package
X-COORDINATE
Use this slot to identify the location of the work package on the horizontal time line of the network. This could be any number from 1 to n. If several work packages share the same value of X this would mean that they have the same Predecessor work package. This X-coordinate is only used to facilitate drawing the network and has no other significance on game parameters.
PREDECESSOR(s)
Specify the work packages that must be completed before this work package can start; the default value is "0" meaning that no previous Predecessors exist for this work package.

Add A Risk. This is the final and the most time-consuming step in game development. This step provides the game developer with the opportunity to define one or several risk factors for each work package, to give a full description of the risk factors, their probability, and their impact on project success criteria. The developer also has the opportunity to include a link to a YouTube video that could be played when a risk occurs. The game developer could identify means to eliminate the risk factor and define the associated costs of eliminating the risk factor. Players have great potential to contribute to this step by using their knowledge and expertise to discuss and define potential events that pose a threat to project duration or budget or customer satisfaction. Impact on customer satisfaction could also be positive or negative. Care must be taken when specifying the impact of risk and the costs of eliminating the risks. These two values should be balanced in such a way that players experience the significance of assessing risks before making a decision.

TABLE III. ADD A RISK DIALOG BOX

WPID
Specify the work package ID.
DESCRIPTON OF RISK
Provide a description of the risk factor, for example bad weather conditions, or equipment problems, or malfunction of tools, or problems with an employee; this description will be displayed to the players during simulation.
PROBABILITY
Enter a number between 1 and 100, representing the likelihood of the risk occurring. The probability will not be displayed to the players. They have to take time and discuss within the group the probability of the event and its impact, based on information provided in the case.
YOUTUBE URL
Enter the YOUTUBE URL to link the risk factor to a video clip on YouTube.
WHEN THE RISK OCCURS (SPECIFY THE IMPACT OF THE RISK FACTOR ON THE PROJECT):
DESCRIBE WHAT HAS HAPPENED
Use this slot to describe to the players what has actually happened; describe how the risk materialized.
IMPACT ON COSTS (MONEY)
Use this slot to specify the consequences of this risk factor on costs, for example specify how much extra money the project had to pay because of the occurrence of this risk factor.
IMPACT ON SCOPE (HOURS)
Use this slot to specify the consequences of the risk factor on the scope of work in hours as a result of the occurrence of this risk factor. For example, enter the number of hours that had to be used to eliminate a problem caused by the occurrence of the risk factor.

IMPACT ON DURATION (DAYS)
Use this slot to specify the impact of the risk factor on project duration. For example, enter the number of days the project had to be stopped as a result of the occurrence of this risk factor.
CUSTOMER SATISFACTION
Use this slot to specify the impact of the risk factor on customer satisfaction. Impact could be any number between (0-100). Negative numbers could be entered as well.
MEASURE TAKEN TO ELIMINATE THE RISK FACTOR
DESCRIPTION OF THE MEASURE TAKEN
Use this slot to describe what have been done in order to eliminate the risk factor.
IMPACT ON COSTS (MONEY)
Use this slot to specify how much money was used to eliminate the risk factor. For example, specify how much extra money the project had to pay to a more reliable postal service to avoid transportation delays.
IMPACT ON SCOPE CHANGE (HOURS)
Use this slot to specify in hours how many extra hours were used to eliminate the risk factor. For example, specify how many hours the project needed to check and control machines and equipment up front.

IMPACT ON DURATION (DAYS)
Use this slot to specify in hours how many days were used to eliminate the risk factor. For example, specify how many days the project has to be put on hold to avoid bad weather conditions.
IMPACT ON CUSTOMER SATISFACTION
Use this slot to specify the impact of the measure on customer satisfaction, if any. Impact could be a number between (0-100). Negative numbers could be entered as well.

III. PLAYING A GAME.

As mentioned previously, the players are project managers in a fictional company and they are given the task of completing the project and satisfying all project success criteria. The interface between the players and the game takes place through the game navigation window, shown in Figure 1. The game navigation window is generated by the template and also assigned a unique URL that could be accessed using a personal computer or any handheld device. An active work package is marked in black, a completed work package is marked in green, and an inactive work package is marked in grey.

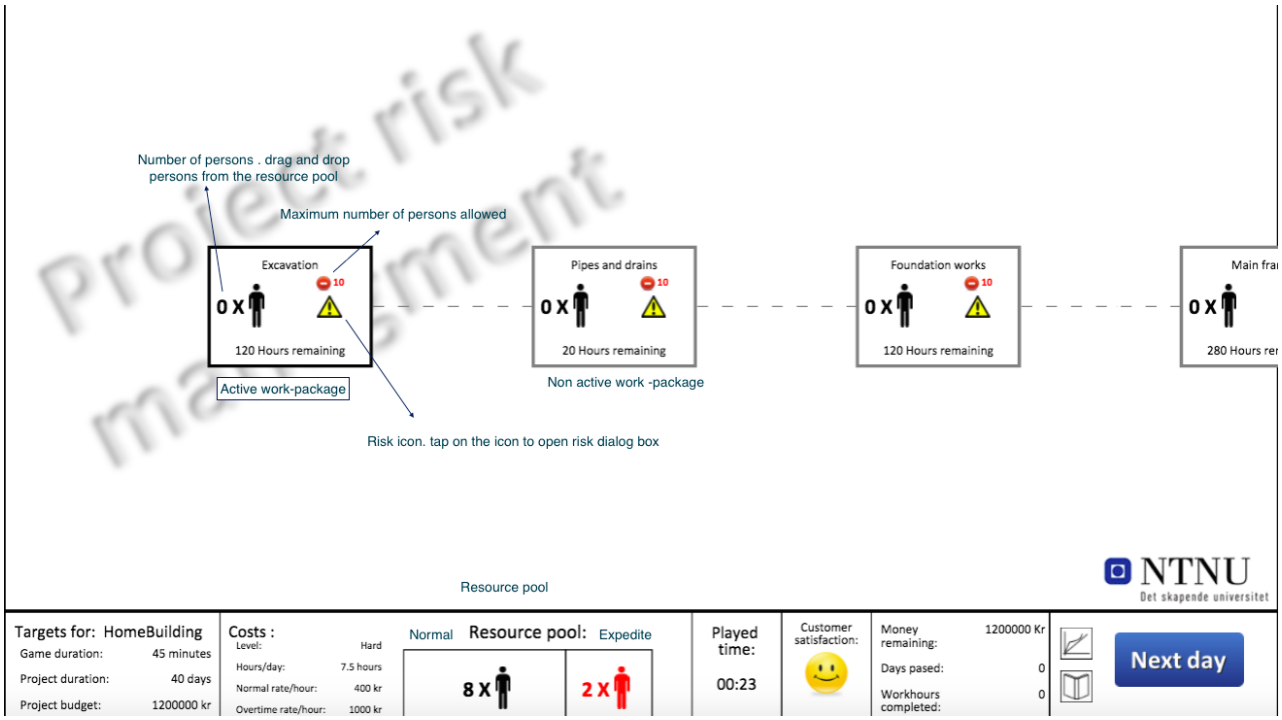

Figure 1. Game navigation window

There are three tasks that the players must perform to complete a project (playing the game):

Assign resources to active work packages: Use the human resources available from the resource pool shown at the bottom of the navigation bar in order to complete project activities in the shortest possible time. Resources are added to the active work package(s) by dragging and dropping person icons from the resource pool to the active work package(s) box. Specifying the number of resources is answering the question; providing that the workload of the work package is equal to, for example, 120 hours, and if each person is working 8 hours per day, how many persons do you need in order to complete this work package in, for example, 3 days? Obviously if there is only one active work package and a resource pool of five persons and there is no limitation on the number of persons in that particular work package, then the only thing to do is to drag and drop all the available persons in the resource pool to complete the work package as fast as possible.

Assess and mitigate risks. The second task that should be performed by the players before starting the simulating by clicking on (Next Day) bottom at the right hand side corner of the navigation window, is to assess and respond to potential risks. The players should review the risks of each work package and take a decision on whether to eliminate the risk or accept it. Neither the probability of risk nor consequences are shown to the players during the simulation. This is one of the tasks that the players have to assess during simulation. Tapping on the risk icon ⚠ opens the risk assessment and mitigation dialog box illustrated in Table IV.

TABLE IV. RISK ASSESSMENT AND MITIGATION DIALOG BOX

Risks for: Work Package Excavations
Below, is a list of possible risk factors that are relevant to this work package. Shown below each risk factor is the cost of eliminating the risk in terms of additional costs, work hours, time, and customer satisfaction. Your task is to assess the likelihood of the risk and its potential impact, and then decide on whether to accept the risk or eliminate it by checking the box next to the risk factor and then hitting the ELIMINATE Key
☐ *Bad weather conditions* ***Measure to eliminate the risk factor:*** You order a weather forecast report from two different stations and you select a proper weather window to start excavations. This report costs you an extra 6,000 kroner, but your client seems to appreciate your professionalism.
Price: 6000, Scope: 0, Time: 0, Customer satisfaction: 5
☐ *Problems with your neighbors* **Measure to eliminate the risk:** You install a fence around the construction area, so no unauthorized persons can enter the site. It takes you 4 hours to complete the fence and 1,000 kroner for the material.
Price: 1000, Scope: 4, Duration: 0, Customer satisfaction: 0
☐

Let us assume for the sake of illustrating how the simulation works, that the player has selected to eliminate the first risk factor and leave the second risk factor unchecked and then hits the (Next day) button to start the simulation. The simulation engine then generates a random number from 1 to 100 and selects a risk factor that has a probability above this random generated number. If two risk factors have a probability higher than the randomly selected factor, the simulation picks the one with the highest probability. The consequence of the event is then displayed to the players at the top of the navigation window. This is illustrated in the following example:

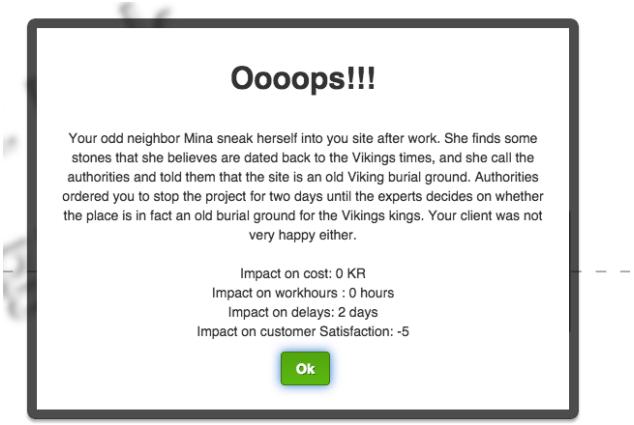

Figure 2. Event occurring during the simulation and its impact

Follow up and Control. The third task that should be performed by the players is to follow up on the project to make sure that the project satisfies all success criteria. This is achieved by providing players with updated status information about earned value EV(t), number of days passed (t), total accumulated costs AC(t), and status of customer satisfaction. Players then have to use this information to make decisions when mitigating risks, or allocating resources to each work package. The decisions taken will affect cost, duration, and customer satisfaction.

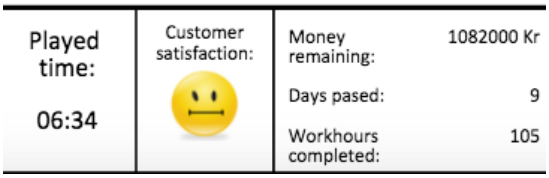

Figure 3. Status information bar

In addition to status information, players can also access a graph that illustrates the development of the cost performance index (CPI) of the project during simulation. The index shows the relationship between actual cost and earned value. It is an indicator of how well the project is developing in terms of cost. The CPI-curve is updated after each completed work package.

A reflective analysis of the information offered by the CPI-curve should help players to think carefully during the risk assessment and prioritization of subsequent work packages.

Another indicator that is provided to the players to help them assess their performance is a projection for actual costs at completion, AC(p), which is calculated as follows:

AC(p) = (budgeted costs/CPI)

This indicator tells simply what would be the total costs of the project if the players continue to perform as such.

The third indicator provided to the players is a prediction of project duration at completion, T(p).

Access to other players results: During simulation players will also be able to view status information of other players, including:

AC(p) and T(p) and status of customer satisfaction.

Accessing this information will help to add an element of competition to the simulation and increase engagement and motivation.

Final evaluation. At the end of the simulation, that is, after delivering the results of the project, the simulation engine displays the final results for the players, including:

- Overall assessment: (excellent, good, or poor)
- Budget savings/overrun
- Actual project duration at completion
- Customer satisfaction (the face of the customer)
- Number of risks mitigated
- Number of risks occurred

IV. RECOMMENDED INSTRUCTIONAL DESIGN

In order to take full advantage of the opportunities provided by the template it is advised that the instructor makes sure that the following steps are included and uses the recommended instructional methods in order to attain all the learning objectives of the game.

Preparing the players: The description of the project and the individual work packages that are needed to complete the project should be posted to the students in advance prior to playing the game. A leaflet containing information about typical risk factors or events and their impact for this type of project is also provided to help students understand the type of project. They are then invited to suggest or think about possible risk factors that they believe are actual for each work package. A template is provided to the students so that they can use it to fill in their own defined risk factors. The template is shown in Table V.

TABLE V. TEMPLATE TO IDENTIFY POTENTIAL RISK FACTORS TO INCLUDE IN THE SIMULATION

Work package
Description of the risk factor
How do you assess the probability of the risk factor (low, medium, high)?
How do you assess the consequences of the risk factor on, for example, duration, cost, or customer satisfaction?
What type of measures do you suggest in order to eliminate or reduce the impact of the risk factor on the project?

The students' input is then collected and revised to remove duplicates and then added to the simulation using the function Add or Edit Risk in the template.

Simulate: The simulation itself takes place inside the classroom under the supervision of the instructor. But it can be played individually as well. Players form groups of 3–4 persons. The task is to complete the project according to the specified success criteria. At the start of the simulation, the players have to select the level of difficulty of the game. There are two choices (Hard and Easy). In the hard version of the game the players would be charged with liquidated damages if they overrun the project duration or game duration. In the easy version, no charges are added if they exceed these two parameters.

The simulation engine then randomly selects risk factors from the database for each work package. The list of risks usually includes risk factors identified by the players themselves prior to the simulation and which are added to the database, or risk factors identified in previous experiments by other classes. The database can, therefore, be seen as an incubator for risk factors.

No information is provided to the players about probability or the consequences of each risk factor. During simulation, players should use their own experiences as well as the information provided in the leaflet to assess the likelihood and consequences of each risk factor displayed. Failure to assess risks correctly will ultimately result in failure to respond to critical risks. This might result in severe delays, penalties by authorities, slow progression, and so on. Visual effects such as video clips from YouTube are used to illustrate the consequences of failing to assess risks. Players are encouraged to search the Internet for more information on typical risk factors for this kind of project and their impact.

Debriefing session: The debriefing lecture takes place at the end of the simulation. The instructor evaluates the performances of each team, and revisits and discusses execution strategies. The efficiency of communication in the team and reflections about bias and heuristics during execution [17] are also discussed with teams by linking the results to project management theory and identifying lessons learned. The pitfalls of assessing risk factors such as indifference, haste, and bias are also reviewed. Strategies to encounter these pitfalls are also presented such as the importance of supporting the assessment with historical data from previous projects [18].

Learning outcome and student evaluation: This exercise gives the students the opportunity to look into projects from a holistic point of view, such as how failing to manage risks impacts the project objectives and how resources should be used to balance demands of time and cost. The feedback can be given instantly through information about actual cost, earned value, prediction of actual costs at completion, prediction of duration at completion, and the level of customer satisfaction.

V. STUDENT EVALUATION

What we have gained from this exercise is the creation of a learning environment where players can see how their decisions have an immediate effect on project

performance. Then, the results obtained by the students are analyzed in terms of best practice in project risk management. The majority of the students indicated that this assignment was very important for their learning. After the game, students were asked to express their views about the game and how the game contributed to their learning. We list a few of these quotations from student responses:

"Helped me to understand the phases of project, how resources could be allocated, how risk arises and how it should be mitigated. Overall overview of a complete project could be viewed."

"Learn consequences of your actions. You have to make choices."

"I believe that was a practical practice which helped me to use the theoretical in a semi-real simulation."

"A very interesting game that woke up the manager in most of us! Valuable in terms of understanding how to distribute resources and handle risks."

VI. CONCLUSIONS AND FURTHER IMPROVMENTS

The aim of the paper is to demonstrate in detail how the PrimaGate template offers game developers and learners a flexible development tool to build risk management games. The core focus of the design was to create a learning environment that facilitates involvement and engagement of learners and provides learners with a sound understanding of the complexity of the project risk management process as well as providing students with the necessary knowledge and skills to identify, assess, mitigate, and follow up project risks. The template also provides instructors and game developers with greater flexibility to specify the challenge level of the game and adjust it according to the learner's level of competence.

Core strategy was based on the idea that active participation, involvement, and competiveness are very important to sustain motivation, create interest in the subject, and give participants a meaningful learning experience. Based on the qualitative feedback from students we believe the game has attained its main goal of creating a meaningful learning experience. One important condition for achieving this is giving feedback to the learners. The actual learning and reflection takes place as a result of providing feedback either during or after the game. Readers are invited to view the template at www.primagate.no.

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