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SWING - Simulation, Workshops, Interactive eNvironments and Gaming: An Integrated Approach to Improve Learning, Design, and Strategic Decision Making

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Abstract
Simple games are often used as illustrative elements in teaching and learning activities. However, there could be a different way to regard games and evaluate their effects in terms of learning mediation. Younger people have experienced that electronic gaming has gone from a minority activity a few years ago to mass entertainment today. Is it only entertainment for young people or is it a potential booster in the way we facilitate learning? The word "game" itself does confuse matters by evoking childish playthings but there are a substantial number of indications that games hold a key to a significant change and efficiency in the way we learn. In this paper we shall discuss the impact of games on learning in professional organizations. This will include a review of our ability to learn as an organization and development of a framework to integrate games in learning processes. The empirical context of the paper will be product development processes.

Keywords: Learning, Games, Workshops, Simulation, Decision Making

Introduction
An organization's innovation process is driven by its ability to learn. Although the concept of learning in organizations is far from new, we are still in a situation where most organizations suffer from "learning disabilities." Learning in organizations is truly difficult. To learn in organizations, we need: to create the right culture for learning; to have sufficient time; and to implement learning-oriented approaches.
Our learning culture is determined by our experiences in school. By the time all children are 10, they have learned what it takes to get ahead in school and please the teacher – a lesson they carry forward through their careers of "pleasing bosses and failing to improve the system that serves customers" [1]. To challenge this cultural heritage, we need to create a setup where "what is" and "what we use to do" can be questioned, and "what could be" and "why don't we" can be encouraged and facilitated.
Among the few documented parameters that correlate with learning is the time we spend learning. The time available for people to think and reflect is scarcer, if anything, and within

the predominantly task-oriented organizations of today, resources available for developing people are scarcer still.
The prominent learning-oriented approach is the traditional mode of classroom teaching. However, this is only a valid method for teaching novices, and even then its efficacy can be debated. To augment the way professionals learn there is a need to introduce interactive methods that support experimentation and reflection [2, 3]. Furthermore, there is the need to cultivate a culture of learning and openness which quite often conflicts with the imperative of meeting task deadlines. And finally there are the challenges of synchronization and timing, having to do with all three movements: task execution, culture cultivation, and interactive methods for experimentation and reflection.
In this paper we shall discuss these challenges in the light of recent research results that support this requirement for synchronization. The empirical dimension of the discussion is our prior experiences with simulation tools [4, 5], experiences with company specific workshops [6], and early results from a newly initiated EU-project named PRIME, "Providing Real Integration in Multi-disciplinary Environments" [7].

Elements in a learning practice

In professional settings learning takes place in a specific environment. What we mean by environment is the sum of all forces that affect an organizations actions. When we learn, we reach a better understanding of this environment and improve our ability to adapt to it, and consequently, we build a basis for changing it. Therefore, the environment gains an interactive dimension and promotes further learning.
Our framework postulates four different type of learning mechanisms: Workshops, Simulations, Interactive Environments, and Games. These four mechanisms have different characteristics, and when applied in various combinations, stimulate the various elements of the learning process. In figure 1, the conceptual model of the SWING approach illustrates the relationship between the four mechanisms (Simulation, Workshops, Interactive eNvironments and Gaming).

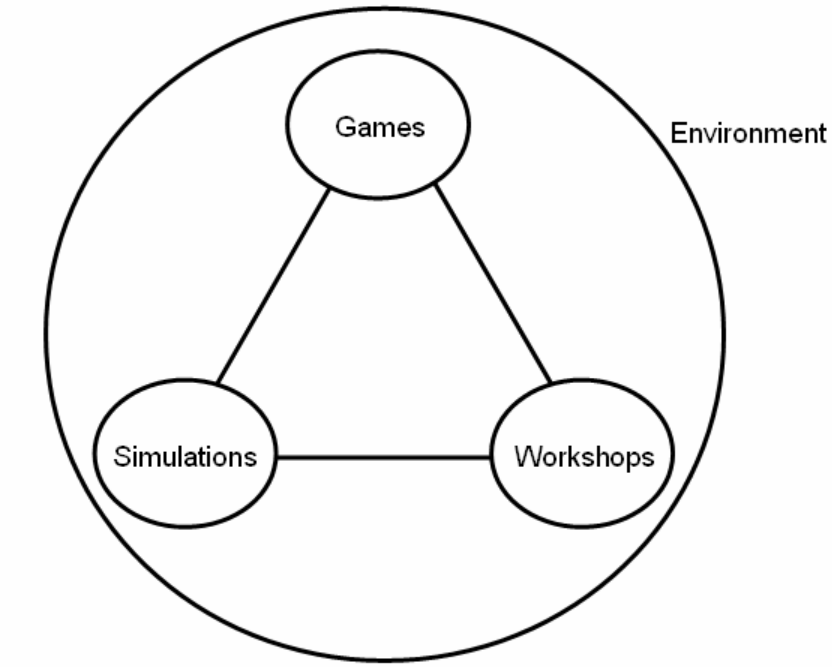

Figure 1: The conceptual model of the learning practice, including the learning mechanisms and environment.

In the following sections, we will elaborate on each of the four mechanisms in the SWING approach and describe their interplay.

Workshops

A workshop is defined as: "*An educational seminar or series of meetings emphasizing interaction and exchange of information among a usually small number of participants*".

The workshop mechanism is the social engagement element of our model, which necessitates workshops as a part of any learning process. Relatively simple problems can normally be handled by a workshop alone; for example, when a small group of people gather to solve or to communicate an experienced problem. As problems become more complex the efficacy of workshops as a stand-alone learning mechanism decreases.

When the number of variables increases, our ability to handle new information reaches its limits, in which case we often do either what we have done before, or negotiate a potentially non-optimal compromise. Both strategies are conservative from a learning perspective, and they might not address the problems that are being faced.

The French have a proverb regarding the first strategy, which might hold some truth regarding political development: "*L'histoire se répète.*" However, in professional organizational settings, doing what has been done before might be a threat to the survival of the organization. Despite this implication, it is often chosen as a strategy since it lies within the comfort zone of the decision makers.

The second strategy - seeking a compromise - might be a good solution if all the options are known in advance. However, there is a high risk that the compromise becomes a political decision rather than an informed decision. A former R&D manager at Bang & Olufsen once put it this way:"Compromise is the ugly cousin of synthesis."

Simulations

There has been a long history of the application of computer simulation models to the functioning of organizations [8]. The act of simulating a phenomenon generally entails representing certain key characteristics or behaviors of a selected physical or abstract system. Simulation is used in many contexts, including the modeling of natural systems or human systems in order to gain insight into their functioning. Other contexts include simulation of technology for performance optimization, safety engineering, testing, training and education. Simulation can be used to show the eventual real effects of alternative conditions and courses of action. Key issues in simulation include acquisition of valid source information about the referent, selection of key characteristics and behaviours, the use of simplifying approximations and assumptions within the simulation, and fidelity and validity of the simulation outcomes.

In our prior work with university students and with private companies, we have experienced problems in providing the participants a truly hands-on experience while using simulation-based approaches [4, 5]. In most applications, simulation tends to be a specialist tool that is often applied in an asynchronous way. The implication of is that the interaction element becomes weaker.

Michael Schrage describes the case of a nearly fully democratized simulation tool [9]. He refers to the emergence of the first Spread Sheet programmes in the early 80'ies, where the complicated art of simulating a budget – an activity that prior would require huge resources – suddenly became possible for most people. The result was a boost in the production of budget simulations. However, there was a significant problem: most of the simulations were based on "low-quality" data, which in turn resulted in a general lack of trust in budget simulations.

Interactive Environments

By interactive environments, we refer to the social, physical, and informational environments in which we live and work. To survive, an organization must continuously monitor its environment and respond to it. Socially, the environment consists of various relationships an organization has developed with suppliers, lead-users, and retailers as well as within its business units. Physically, the infrastructure of an organization has a strong influence on habitual behavior of its members. Informationally, the new information and communication technologies are constantly changing the essence of an organization. In particular, hitherto ephemeral organizational experiences can now be externally and digitally stored for later reflection and improvement. By altering the physical and informational environment of an organization and changing the social rules, organizations now can experiment with alternative identities in the context of others.

Games

In "Got Game", John Beck and Mitchell Wade argue that gaming provides excellent training for professionals in business [10]. Gamers, the authors write, are skilled at multi-tasking, good at making decisions and evaluating risks, flexible in face of change and inclined to treat setbacks as chances to try again.

The changing role of gaming was also an issue for a special report in The Economist [11, 12]. Under the provocative title “Breeding Evil?” gaming is discussed from the perspective of the age of players and habits of a new generation, and is viewed in line with rock and roll. Like rock and roll in the 1950s games have been accepted by the young and largely rejected by the old. Once the young are old, and the old are dead, it is possible that games will be regarded as just another medium and the debate will have moved on.

The new insight into how games can be used in professional setting has triggered a range of activity to develop games for this particular purpose. We participate in one such project funded by the EU, PRIME [7]. The main objective of PRIME is to give business professionals a learning environment where they can experiment with new ideas and learn how to handle the entire life cycle of products and processes for all stakeholders of the organization. PRIME proposes to achieve this by enhancing current work environments with a new paradigm based on “serious” gaming. This will provide the means for learning by experience within a virtual environment that is safe and foments risk taking without detrimental impact on the business. The experience garnered is based on strategic management, including multi-stakeholder negotiation and business connectivity.

The two main expected gaming relevant outcomes of PRIME are: a way to reinforce the sense of competitiveness through “training” of professionals in various expected or unexpected scenarios; and a way to reinforce sustainability of products, industrial and business systems by allowing stakeholders to obtain better knowledge and evaluate sustainability issues. These developments within the gaming paradigm for professional purposes lead us to reconsider the existing mechanisms that augment organizations’ ability to learn. However, we need to consider how games can play a role together with the elements we already know. This is our motivation for proposing the SWING approach.

The SWING approach and the learning process

The SWING approach aims to improve the self-efficacy of an organization. By self efficacy we mean the belief in one’s capabilities to organize and execute the sources of actions required to manage prospective situations [13]. This belief is developed by organizations through experience and feedback as they learn and successfully adapt to new situations in the market environment. In figure 2, the ability of an organization to learn from its environment is shown as necessary conditions for its survival and growth. Its movement within this

environment, best conceptualized in terms of its strategic decisions and behavior, complement its learning ability, and together they constitute the necessary and sufficient condition to predict an organization's likelihood of growth and survival. We have used the word "likelihood" here because the environments of interest to us are dynamic, with elements that are ambiguous, and others that are uncertain, and in the best of worlds we cannot predict with absolute certainty. Within this context then, the SWING approach represents that smallest set of activities an organization could carry out to effectively maneuver within its environment, impact its environment, and learn from its environment. In the figure, the black layer represents the difference between what an organization knows about its environment (learning) and what it needs to know (business intelligence) in order to make the best decisions. A thinner layer implies better knowledge of its environment.

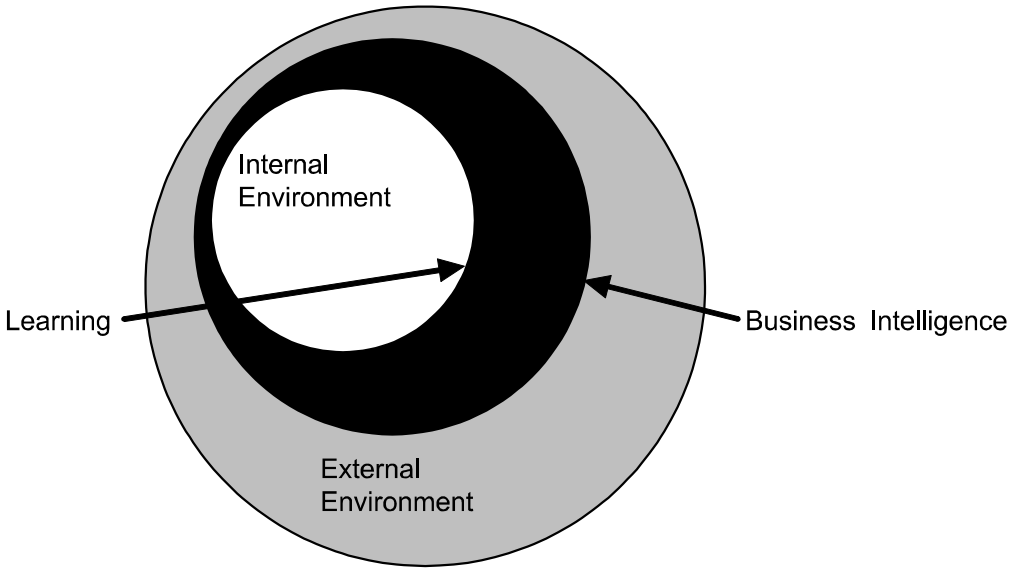

Figure 2: The room for learning and growth for an organization.

Organizations are composed of humans. This fact is sometimes lost because we often conceptualize organizations as machines and other non-human entities. As living entities, activities within an organization need to have aspects related to Cognition, Emotion, Conation, and Action [14]. The SWING approach can be mapped to these aspects of human experience as is shown in table 1.

Table 1. Mapping the SWING elements to aspects of an organization as a living entity

	Cognition	Emotion	Conation	Action
Simulation	xxx	x	x	x
Games	xx	xxx	x	x
Workshop	x	x	xxx	x
Environment	x	x	x	xxx

The simulation is primarily mapped to the cognitive domain because simulations tend to work with real data, and an attempt is made for precision by using very specific principles. Games on the other hand use very general principles. There is an emphasis on fun and entertainment—the experience. Thus we have mapped games to the emotional dimension. Workshops involve to a degree discursive activities. The results of workshops are emergent with several possibilities including creativity, reflection, spontaneity, paradigm shifting, relationship building, design, and decision making. This highly social engagement has been

mapped to the conation dimension. Conation is not a term one often encounters. It refers to the aspect of mental processes or behavior directed toward action or change and including impulse, desire, volition, and striving. It is in workshops that we have the opportunity frame issues and to build consensus about future action in the world. These are actions we know conceptually but have not experienced in a bodily sense. The interactive environment provides us the opportunity to create embodied prototypes of future actions. Some companies have used real life actors to role play, others have engaged their lead users, and others have prototype new physical infrastructures to discover the actual changes in behavior they could produce.

In summary: games give us opportunities for emotional play; simulations provide opportunities for conceptual play especially to examine the evolutionary properties of systems; workshops provide opportunities for social play and being discursive they allow us to clarify needs, to frame problems, and to build consensus. Finally, interactive environments allow us to experience our selves in new situations. The SWING approach thus provides a mechanism to instantiate all four aspects of the Kolb learning cycle [2]: Simulations representing abstract conceptualizations and active experimentations; Games representing concrete experiences and active experimentations; Interactive Environments representing abstract conceptualizations and concrete experiences; and Workshops representing reflective observations and concrete experiences. It is our hypotheses that this approach will improve the participants belief in their capabilities to organize and execute the sources of action required to manage prospective situations - in short their decision making efficacy.

In the next three sections, we would like to use excerpts from a real life example of a workshop that was held in a company to provide an example of the foregoing description. In addition we would like to discuss issues related to the timing of SWING activities during the product realization process.

Case Study: Workshop Fragments

The specific perception and visualization of “Innovation” inside a company is crucial to establish a deliberate innovation process that can be inspired and developed by theoretical findings and experiences from relevant practical settings. This case describes an attempt to make such visualization by means of a LEGO product. The product is called *LEGO Serious Play* and consists of a physical product of carefully selected LEGO bricks. As an example of a LEGO Serious Play session, workshop participants build models of their perception of the current state and challenges of their company [6]. When all board members have built their models (this may be ten-minute sessions) the members take turns to explain their models to their colleagues.

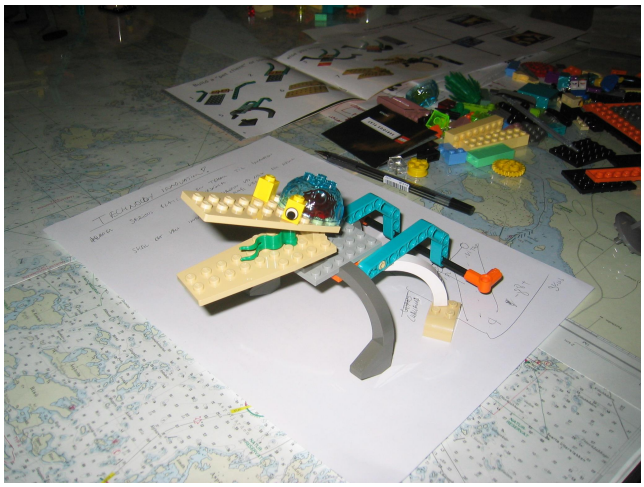

Figure 3: An Image of Innovation via "Serious Play"

Participants will typically engage deeply in the stories and will ask questions such as, "why did you pick a transparent brick to symbolise our marketing campaigns?" This all ensures a much more engaged and lively discussion of the topic at hand. One workshop participant, his model shown in figure 3, explains: "I learn from others, I need stability, so I can look in all directions, my brain is red hot with ideas".

Another participant explains: "I am an innovation animal that scouts for and eats up opportunities and then spits them out in workshops and brainstorms with my colleagues". Finally, a product manager comments: "Innovation is an uphill battle, but can be fun. There are hindrances on the way, but they can be overcome when we pull together. All assumptions and prejudgments must be put away as illustrated by the blue ball hidden under the model. You will find yourself on shaky ground now, especially when you are close to reaching the goal. This was illustrated with an elastic band as the last part of the ramp leading to the ultimate goal."

While the LEGO Serious Play exercise was able to facilitate the expression of how the participants perceive the present innovation state of their company, the participants generally experienced difficulties when entering into a discussion of how to change things for the better. To facilitate that type of discussion we propose prototyping with other activities of the SWING process.

Prototype Development

The following has been chosen as an exploratory situation in which to prototype the SWING approach. An important element in this selection was to define a test environment that was highly challenging to the participating organization. At the toy company LEGO [15], the focus will be on the launch process of new products. Each year approximately 20 new products are launched. These products count for more than 50% of the sales. However, the products rarely sell according to the initial budgets. Some products will sell 4 times the budgeted plan and others will sell significantly lower according to the budgets. The launch process can be seen in three simplified steps: Concept Development, Detailed Product Development, and Manufacturing and Delivery (see figure 4a). The concept development phase leads to approval of the whole portfolio of product to be launched the following year. After the approval the project teams are formed and the detailed product development process starts and leads to the manufacturing and delivery of the products.

Figure 4a: Simplified model of the product launch process at LEGO.

When operating in a highly competitive environment as the traditional toy market there are obviously several challenges related to this launch process. However, we have chosen to focus on two overall challenges:

1. The first challenge concerns the approval of the concepts. During the concept development phase the concept often change due to new inputs regarding competitors and technological possibilities. Only in the last weeks before approval the concepts converge into what is finally presented. During this process the participants from different market segment are extremely focused on their own concepts. In reality, this means that the concepts in then full product portfolio that are presented for approval are not aligned. Seen from the perspective of the individual concept, this leads to pure concepts without compromises. Seen from the perspective of the whole organization, this can easily lead to sub-optimizations.
2. The second challenge concerns the manufacturing setup. As the last part of a chain, the manufacturing unit is bound to adapt and to be flexible due to changes in the market. This is facilitated by establishing flexible manufacturing platforms both within the company and in collaboration with suppliers. The efficiency of these manufacturing platforms is highly dependent on the specific product portfolio. When problems of delivery or quality occur later in the process it is always easy in retrospect to point to the initiating problems regarding the chosen product portfolio.

Both challenges are highly related to the decision on the specific product portfolio. The evaluation of the consequences requires a substantial cross-organizational effort. There is a extensive knowledge of how the effects spread across the organization, but that is often tacit or there are unclear cause-effect relationships. If the consequences of a specific choice of product portfolio can be revealed, it is normally possibly to change elements of the portfolio without weakening the ideas put forward from marketing. But since the consequences are not easily revealed and the number of variables is high, it is not at all clear where to intervene. Given the character of the challenges we anticipate that they are suitable to be tackled with the SWING approach. We will discuss this further in the next section.

Portfolio decision and the SWING approach

The complexity of the decision on a specific product portfolio is anticipated to be too high to be handled by one of the SWING elements for the following reasons:

1. The number of variables is too big to overviewed and handled by a workshop. There is a high risk of the solution being either a compromise (that we really don't know the consequences of) or a solution based on what we have done before (that we really don't know the consequences of either).
2. The complexity is too high to be handled by simulations. The effort to build a comprehensive model that can reflect the complexity is huge and the risk of not succeeding is high. However, elements can be simulated and detailed parts of the solution or refinements can be supported by simulations.
3. Games can only give superficial indications of a solution. However, they can support in testing the robustness of a chosen solution.

Figure 4b: The SWING process occurs at the end of the concept development phase

The conclusion is that each of the SWING elements can support the effort if configured and synchronized properly. In the specific case we have decided to apply the approach at the end of the concept process before the detailed design is initiated (see figure 4b) since this provides us a kind of "time-out". The concepts have been finished and we know the critical differentiating factors of each concept. However, these concepts can be realized in a number of different ways. The workshops can provide us with a rich picture of the situation and propose different ways of interpreting risks. By simulations we are able estimate how different solution might impact the capacity of our manufacturing setup. And by games we will be able to test the potential solutions. Through interactive sessions with our lead users, we are able to estimate the appeal of our products, and through the workshops we are able to consider changes in the process and take in inspirations from other companies. In the particular case it is relevant to consider the experiences from the Japanese car manufacture Toyota. They apply a similar "time-out" period at the end of their concept development phase. They have named this phase Kozukeikaku or just 4K [16].

Conclusion

As mentioned previously, the SWING approach represents a inter-phase duration to step back and take a time-out during the product development process. We believe the point we have chosen--proceeding the concept development phase--is of strategic importance because that is when the financial commitment of the company is still low (but thereafter it will be very high). The decisions made following the application of SWING will have been better informed and decision makers would have had the opportunity to have a deeper understanding of prospective situations. Working in today's interactive environments, a record of their deliberations would be kept for later reviewing and reflection, thus enabling the organization to capture and learn from its past. It is our belief that the quality of decisions will be an important measure of the effectiveness of the SWING approach, and the feedback mechanism explicit in our approach will lead to improved learning, design, and decision making efficacy in the organization.

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