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Exploring flow-promoting management and leadership skills via serious gaming

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ABSTRACT

The considerable proliferation of serious games (SG) in management education necessitates an academic foundation grounded in the concepts and practice of leadership, Flow, learning and development theory. Going beyond addressing the benefits of SG, this study is the first to demonstrate the successful use of SG in two areas: (a) teaching Flow theory within management studies via dedicated software designed to train a Flow-promoting Leadership style; and (b) showing that SG can serve as an innovative tool for measuring 29 leadership skills. The article demonstrates how non-intrusive data – collected during FLIGBY gameplay by 7931 managers globally, who made 150+ simulated leadership decisions – de facto support the process of leadership skill development. The findings show the system of relationships among the four critical Flow-promoting Leadership Skills that are needed for leading a work environment with more frequent Flow experiences. The results support educators and content developers in their quest to find optimal pathways and combinations for effectively developing skills by showing the underlying complexities of Flow and Leadership. The study contributes to the application of Flow-promoting leadership theory in practice via the help of innovative SG technology.

Introduction

Since its discovery by Mihaly Csikszentmihalyi (1990), "Flow" research and its application have become ubiquitous in many fields of science, education, and day-to-day life. Flow is the colloquial terminology for what scientifically is known as an "optimal mental state" that can occur during an activity and is characterized by experiencing happiness, meaningfulness, learning and creativity. During the past two to three decades, we have also seen the spread of game-based learning solutions and systems and the proliferation of interactive and gamified learning environments.

Whilst details of the general use and the benefits of serious games have been widely published (Buzady, 2017; Pérez-Pérez et al., 2021), our study will briefly showcase the application of an innovative and complex management learning system dedicated specifically to promoting the principles of a Flow-promoting leadership style and of Csikszentmihalyi's "Good Business' values (Csikszentmihalyi, 2003).

Debates and speculation about digital solutions appropriate for the measurement of capabilities and leadership skills have been published by De Freitas and Routledge (2013), Greener (2017) and Ştefan et al. (2019). Small-scale studies and pilot research findings have been published about the

successful use of the FLIGBY® serious game for enriching entrepreneurship education on university courses (Almeida & Buzady, 2019), as well as assessing and enhancing entrepreneurial competencies and skills (Buzady & Almeida, 2019a, 2019b). This present study will explore new, more recent data collected from the same serious game system but representing a much larger sample of 7931 managers and leaders who participated in executive courses and corporate training across the globe. Furthermore, our study demonstrates that the use of serious games for measuring leadership skills can spur new academic research that leads to new discoveries about the underlying connections and interdependence of the 29 measured leadership skills and the principles thereof. The empirical analysis supports findings about how to develop leadership skills so that managers and leaders can create organizations and teams in which the Flow experience becomes more frequent.

Theoretical background – serious games and gamification in business education and leadership training

Serious games have developed into a significant factor in education and can now be found "in a range of disciplines from medicine to mathematics and business to the creative arts" (Greener, 2017, p. 2.). This expansion of their use is rooted in technological development as well as the gamification of culture: the new ways of playing and media consumption of young generations (Deterding, 2015). As more and more aspects of our daily lives become digitally mediated, the opportunity (due to the number of platforms) for playing and gaming is appearing in all domains, including education and training (Yen & Lin, 2020).

Gamification and serious games

Due to the development of digital technology, one can play practically on any device and at any time with no regard to the boundaries of the physical environment; this moves the gaming experience from the living room to other domains, such as health applications, e-sports, and from banking to learning (Deterding, 2015). As the development of human and computer interaction moved from a functional and utility-based orientation towards improving user experience (Hassenzahl, 2010), it has increasingly supported user (student) motivation and thus enhanced attention and learning attitudes. This has led to better learning outcomes (Lüftenegger et al., 2014).

Game parameters are usually adjustable, user (=learner) decisions can be logged for later analysis, replay, or repetition, enabling skills development (Buzady, 2017) in a safe environment without taking real risks or making large investments. The modeling of complex business situations supports learning through the search for and interpretation of information, not via reading and memorizing. The application of gamification and serious games for education is especially efficient in business and leadership education, as collaboration, project work, communications skills, problem solving and competition are important factors in that field (Almeida & Buzady, 2019; Buzady & Almeida, 2019b).

Figure 1 illustrates the positioning of serious games within education, associated with three main components: the transfer of theoretical knowledge, game elements, and technical support (Buzady et al., 2019, pp. 89–95). Simulations represent parts of our real world in a simplified but still comprehensible manner (Buzady et al., 2019, p. 90.). Training exercises, which are means of practicing processes and edutainment applications that can attach real experience to learning, are special forms of learning. Serious games join all of these features and enable versatile testing and evaluation before, during, or after the game session (Mayer, 2012) with regard to player attitude, skillset, behavior, and development. Such data represent an excellent source of information for developers, trainers, and players and can be used for skill development purposes.

There are examples of the application of serious games in education and training in a notably wide scope of domains, allowing for risk-free experimentation (Greener, 2017). Zheng and Gardner (2017) showed the cognitive and psychological background of the application of serious
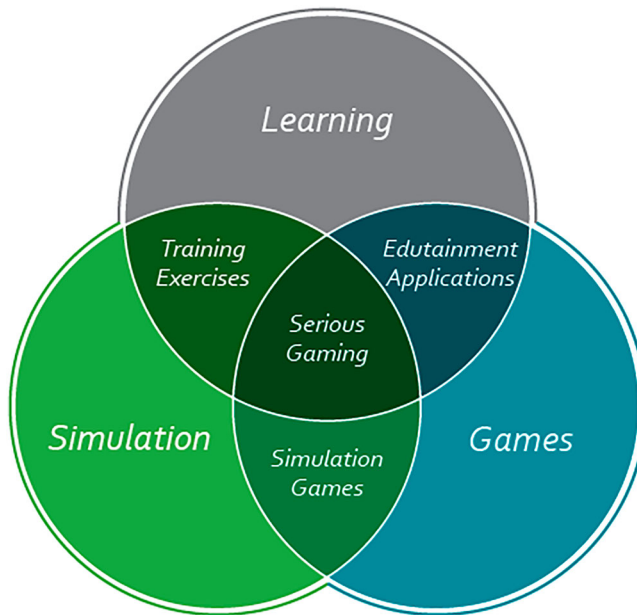
Figure 1. Serious games at the intersection of learning, games, and simulation (Buzady et al., 2019, p. 91). Permission to reproduce figure above obtained from original publisher.

games in education, and also detailed the numerous skills that can be developed with this method, such as critical thinking. Ştefan et al. (2019) analyzed cooperative decision-making, while Pérez-Pérez et al. (2021) reported the corresponding benefits related to entrepreneurship education, similarly to research by Buzady and Almeida (2019a) concerning the business development and motivational impact of educational serious games. De Freitas and Routledge (2013) highlight that the successful development and evaluation of soft skills are different in games than when using in conventional methods. Buzady and Almeida (2021, forthcoming) showed that the use of serious games can also be applied successfully to train how to recognize various leadership styles.

The evaluation and development of leadership skills with serious games

Leadership skills evaluation is traditionally based on self-assessment tests (Devraj et al., 2021) or professional appraisal. The use of serious games may be a more effective means of leadership skill evaluation and development (Westera, W. 2018, Yang, K.H. 2017), because all participants go through the same dilemmas and make decisions based on the same information, which makes it easy to compare gaming sessions or players. There is no bias due to personal relations between the trainer and trainee, and evaluation is purely based on in-game decisions and the application of the respective skillset. As educational serious games are specifically developed using knowledge of the underlying professional domain or syllabus, the evaluation of skills is usually effective as a set of performance indicators, and the tested knowledge material is directly linked to these, resulting in effective evaluation (Hummel et al., 2017). The relevance of this research paper is due to its roots in FLOW theory, an internationally acknowledged behavioral school and its examination of a process of benchmarking involving thousands of users in the same contextual environment.

Having shown the role of serious games in the wider context of management training and skills development, we now present the details of such a concrete training system application, its underlying design concepts, the pedagogical impact thereby achieved, and its scope of application in leadership development.

The role of leadership in promoting flow at the workplace – Csikszentmihalyi's value-based leadership theory

According to Csikszentmihalyi (2003), who first identified the phenomenon of the Flow mental state and was the co-founder of positive psychology, a fundamental tenet of creating a work environment which is conducive of Flow is leadership. Together with fellow researchers William Damon (Stanford University) and Howard Gardner (Harvard University), Csikszentmihalyi conducted deep interviews with top leaders of 39 successful corporations – whom Csikszentmihalyi considered as "combin[ing] high achievement with strong moral commitment, defined as long-term dedication to goals that advance the interests of the community, the people living in it, and humanity in general" (Csikszentmihalyi, 2003, p. 213). The research sample included corporations known worldwide for their social and sustainability innovations, such as Body Shop, and Sir John Templeton's asset fund (Csikszentmihalyi, 2003, pp. 213–2015).

The goal of leadership and leadership development is to create an organizational setting in which employees are highly motivated, deliver peak performance, and demonstrate creativity, the optimal mental state of a person (i.e. Flow) when one is fully immersed (Csikszentmihalyi, 1990). The Flow mental state is also characterized by being energized, highly focused, and experiencing the profound enjoyment of applying and enhancing the skills required for successfully overcoming the challenge at hand – thus a state of overall happiness and well-being. Thus, Flow enhances job and task performance (Kopperud & Straume, 2009). The mechanics of getting into the mental "Flow Zone" are described further below in the concrete context of leadership and managerial interventions.

The responsibility of a good leader goes well beyond merely ensuring the conditions for effective work – it requires creating a positive and creative corporate atmosphere which enables individual and team Flow experiences. A good leader strives to create an organization which contributes to global sustainability and has a generally positive impact on humanity. Therefore, the core mission of leadership development is to enhance the skills of managers and leaders. As discussed above, pedagogical innovations and serious games are fully capable of this.

During the "Good Business' research project, recurrent and central questions included how can specific leadership skills create more Flow experiences for employees at the workplace, and how can those Flow-promoting leadership skills be enhanced through training and development. For this reason, Csikszentmihalyi decided to create an official leadership development program and a serious game, FLIGBY®. He gives a detailed account of the entire design and innovation process, the applied theoretical and academic foundations of Flow theory and the science of leadership: "Next came a science-based contribution: identifying and defining the set of skills that a Flow-theory-aligned manager or leader would likely possess. My background as a psychologist and as the principal researcher for the Good Business book was helpful for this task" (Csikszentmihalyi, 2019; in: Buzady et al., 2019, p. 11).

"Flow is Good Business For You" – FLIGBY®, a serious game for measuring and enhancing leadership skills

FLIGBY® is an innovative serious game for leadership development that was created by Csikszentmihalyi and his colleagues in 2007–2012. The game is designed to serve as an educational bridge between his Good Business leadership principles, Flow theory, and the challenges and management realities of executing and practicing those concepts. FLIBY® is an adaptive learning and training system that conveys the fundamental principles of creating Flow to leaders. A team of academics and Csikszentmihalyi identified 29 essential leadership skills and coded the 150+ decisions which players take during the serious game process to measure which of these skills the player de facto applies whilst handling complex leadership challenges. Over the past years, the learning simulation system has been awarded several serious gaming global awards and various prizes for pedagogical innovation.

During the FLIGBY® game process, each participant individually takes complex leadership decisions which trigger instant learning feedback, drive an interactive movie, influence the simulated multi-dimensional results (profitability, corporate atmosphere, sustainability, Flow/mental level of individual management team members) and feed the algorithm that measures their leadership skills. The "FLIGBY Simulation" is the gaming software which graphically renders the interactive user interface – an interactive movie plot – but also guides the player through the rules and feedback system of the branching decision tree. The system was designed in such a way that the participant also experiences the Flow mental state of being a responsible leader when guiding the organization through complex business challenges. All participants experience the same simulated virtual reality, thus the results of their decisions and their underlying leadership skills are comparable and can be analyzed. During this process, and by repeating the experience in a safe and simulated environment, participants develop their leadership skill set and gain deeper insight into the mechanics of how to promote Flow in their teams and to various personality types, as represented by actors in the plot. This experiental learning "necessitates the acquisition of knowledge though acivte experimentation" (Alrehaili & Al Osman, 2019, p.2.)

The game's results and the leadership skill profiles of the first and all subsequent game rounds are stored in the "FLIGBY Data Base" (see Figure 2). The second, totally separate software engine, the "Master Analytics Profiler," increases the functionality of the serious game: with the help of the "FLIGBY Reporting Module," players' game decisions are analyzed and the resulting reports can be utilized for individual development purposes, but they also enable global and industry sectorial benchmarking.
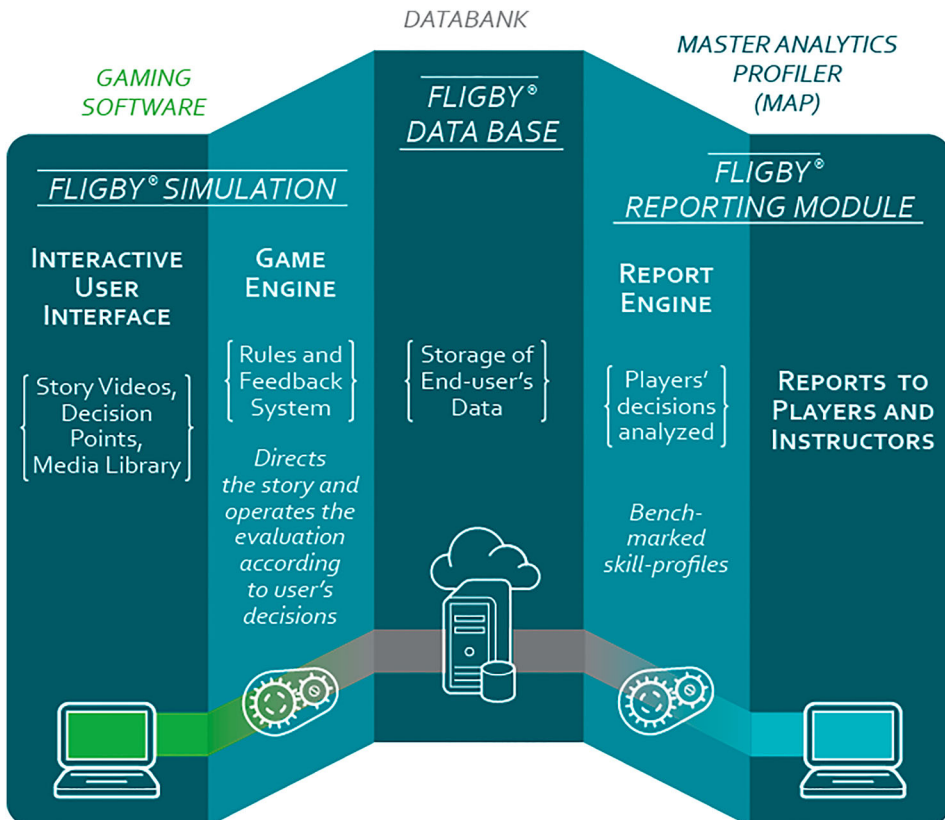

Figure 2. Reporting system and technological background structure of FLIGBY results (Buzady et al., 2019, p. 121). Permission to reproduce figure above obtained from original publisher.

This global dataset is now also being used in current academic research by the Leadership & Flow Global Research Network. The purpose is to demonstrate the unique properties of game-based leadership skills assessment technologies and to more deeply explore their underlying relationships with leadership skills. This approach excludes the bias typically inherent to all classic "standardized personality questionnaires." Decision-based skills profiling is also more objective then subjective assessment undertaken by externally assessing leadership skills (Buzady et al., 2019, p. 173; Badibanga & Ohlson, 2021).

The Flow-promoting leadership skills measured in FLIGBY®

Numerous taxonomies and categorizations of leadership and management skills exist, of which one of the most often used is Gallup's "Strengths Finder" (Harms, 2017), which utilizes four major dimensions: Strategic, Executing, Influencing, and Relationship-related leadership skills. Figure 3 summarizes the 29 leadership skills measured by FLIGBY categorized into the Strengths Finder themes.

The varying leadership situations and complexities require different combinations of the 29 skills for leadership success, and all of them to a certain extent support managerial effectiveness and the potential of a leader to experience Flow at the workplace. By gradually developing the skills required to manage a specific leadership challenge, a person can avoid anxiety and experience the Flow mental state. Conversely, if underchallenged and feeling bored, a leader can regain meaning in their work by raising the complexity level adequately to match their higher-level skill set.
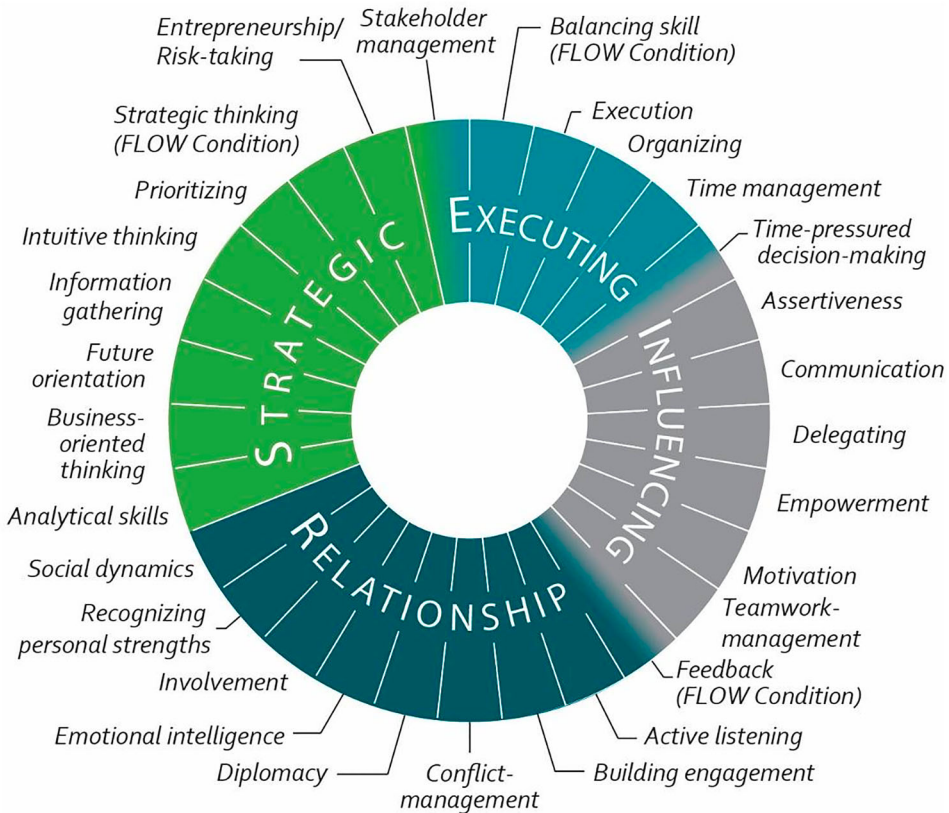

Figure 3. Csikszentmihalyi's leadership skills arranged according to GALLUP_Strengths Finder's themes (Buzady et al., 2019, p. 63). Permission to reproduce figure above obtained from original publisher.

As a result of his wide-ranging Good Business research project, Csikszentmihalyi (2003) identified the mechanisms of creating Flow as a leader, while Buzady et al. (2019) described those four core "Flow-promoting leadership" (FPL) skills: the Strategic thinking leadership skill defines a clear overall direction and strategic goals. Without more distant targets, employees cannot see how their activities and efforts align with a structured set of overarching outcomes. Such higher level, more complex goals are the first element of finding meaning in one's work activities – thus for generating the Flow mental state. Feedback – instant and actionable – is also needed for the Flow experience. Leaders must excel in their ability to provide positive reinforcement, or, if necessary, corrective feedback to their team members and employees to guide their efforts and activities. Without feedback, employees cannot adapt accordingly and may feel redundant, disengaged, or insecure at work (i.e. the extremes of boredom or anxious mental states). Recognizing personal strengths is the leader's skill of being aware of the resources (human) and skills available in their team; i.e. knowing about individuals' abilities, strengths, experiences, and dispositions. Exploiting organizational and team competitiveness begins with the leader having a realistic picture of what is possible and realistic when actively building on the human (knowledge), social (external networking) and psychological (optimism, resilience, efficacy) types of capital of her team. Flow and meaningful work occur when a person's strengths are recognized and appreciated in a work context. The Balancing skill of a leader refers to their being able to define the appropriate level of challenge given the specific level of employee skill, thus not underutilizing individuals (boredom) nor overburdening (anxiety) them (see Figure 4). This leadership skill is needed to create a dynamic balance over time and foster continuous development through the interaction of a changing external environment and internal resources and employee skills. As a result, the level of competitiveness gradually increases and employees and team members can repeatedly experience higher levels of Flow, success, and happiness at work.

FLIGBY players and their teachers receive detailed reports on their 29 leadership skills: these show their individual scores as well as peer and global benchmarking data (Figure 4).

FLIGBY is a real example of how serious games can support business education and leadership training. Following this outline of Flow's support for leadership skills, we now reveal the connections of the latter with the former using data collected through FLIGBY® serious gaming.

Methodology

Since 2012, more than 8000 managers and leaders across the globe have completed the FLIGBY® serious game as part of Flow-leadership-development corporate training associated with university courses. The software system tracks all gamer decisions and generates detailed statistical descriptive and analytical reports for player-participants about their game results and their 29 leadership skill sets on a scale of 0–100 (i.e. percent), depending on how often they used a particular skill during the full game process. Qualitative analysis is also possible by exploring the concrete decisions involved in the alternatives available for solving dilemmas and which choices the given player and her comparison peer-group made. Furthermore, this data can be provided to participants' teachers/trainers and corporate HR leaders. FLIGBY® thus enables state-of-the-art data-driven talent management projects, and is a concrete application of game-based psychometric profiling. Players also self-report demographic data, national and organizational affiliation, as well as respond to a set of questions about their past and present leadership experiences and future ambitions. All data is fully anonymous and cannot be traced back to individuals by the researchers who use the coded data sets.

In our present study, we analyze the relationships between the 29 leadership skills, with a special focus on the four Flow-promoting skills (FPL) using the latest data set (June 2021) of 7931 individuals from FLIGBY's® first gameplay results (46.9% female; 53.1% male). The anonymous dataset was supplied to the Leadership & Flow Global Research Network at the Corvinus University of Budapest, Hungary (https://flowleadership.org/research-program/) by the game developers, ALEAS
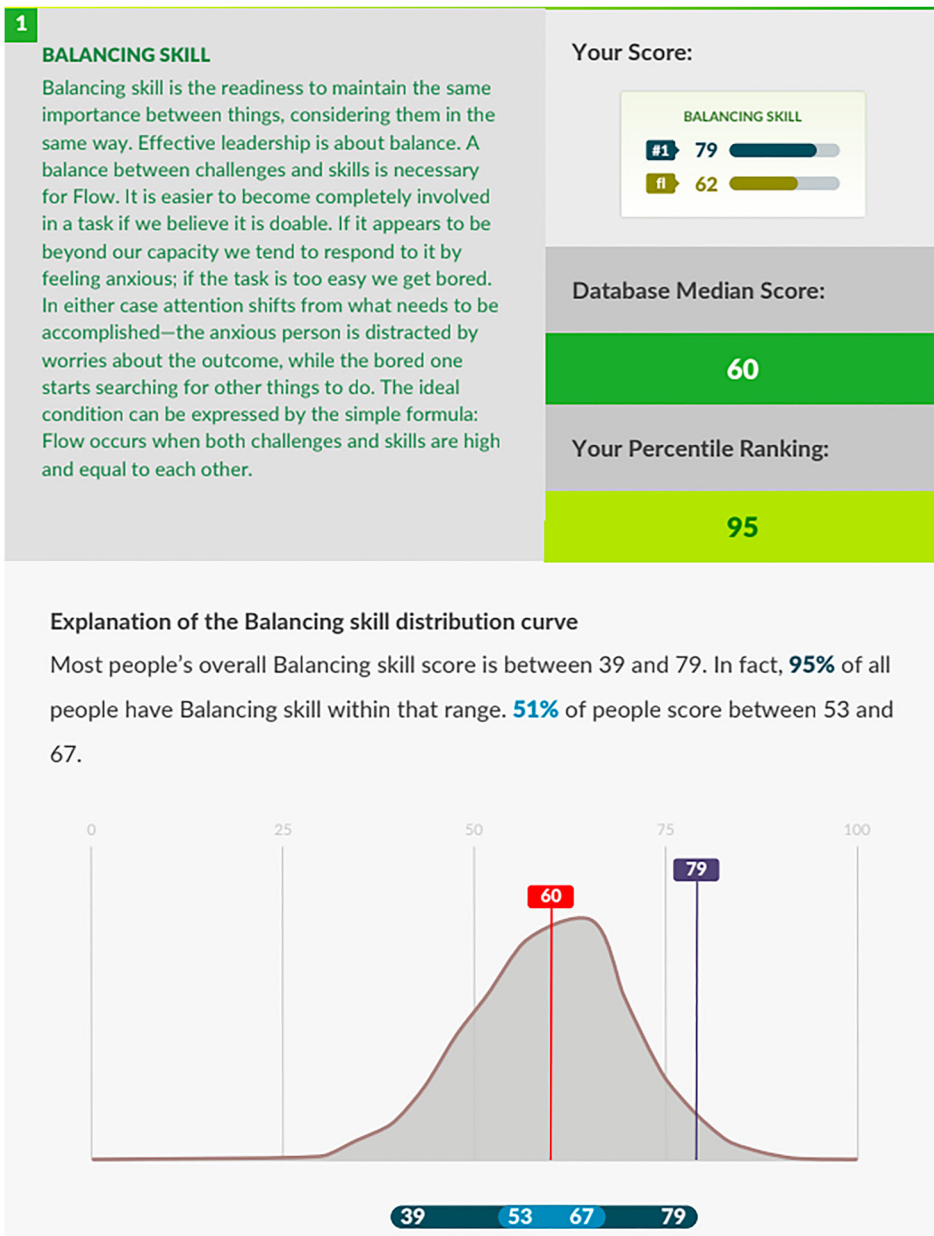
Figure 4. Sample of FLIGBY®'s individual leadership skills results reporting (report excerpt p.33.).

Simulations Inc., California USA, for research and publication purposes. Thus, the researchers were not included in the global data collection process.

Our research dataset was trimmed so as to contain only the results of the players' first game round (we excluded their second and all subsequent game round data). Second, we removed extreme outliers associated with individuals who cannot be considered to have taken the gameplay seriously, so as to more accurately represent the sample's true leadership skills. Players who took less than two hours (i.e. 7000 seconds) of gaming time and those who took longer than 10 hours (36,000 seconds) to complete were filtered out. Mean completion time was 5 hours 42 minutes, i.e. 20,520 seconds. Data collection occurred between 23 May 2012, and 30 June 2021.

FLIGBY® is being played in many languages – the original version is in English, but subtitles, the game interface, and multi-media library support materials are available in the Portuguese, Russian, Turkish, Hungarian, Georgian languages, just to name a few. A majority (5696; 71.8%) of players opted for the English language version, 1250 (15.8%) played in Hungarian (in which language FLIGBY® was piloted first), 359 players in Turkish, and 255 in Russian. Participants played FLIGBY in 103 countries around the globe. Our analysis excludes all those game rounds for which the given language version was not used by at least 10 people (we considered these as merely being beta/test language versions of the software).

Participants were asked to name the industries they were associated with: industries represented by more than 300 game participants included banking (368), computer games (391), education management (309), and higher education (310). Participants also reported their work and leadership experience: The greatest proportion of players (1946) had 1–3 years of leadership experience, thus almost a quarter of our sample in the trimmed research data base (24.5%). The second largest cohort (1672 – 21.1%) declared that they had no supervisory experience yet, followed by 1375 (17.3%) who reported 3–7 years of managerial experience, while 1371 (17.3%) had less than one year of management experience. More than one thousand individuals (1154; 14.6%) had between 7 and 15 years and 413 (5.2%) more than 15 years of management and supervisory experience.

As part of our analysis, we provide descriptive statistics and also relationship analysis – specifically, the Pearson linear correlation coefficient results. The indicator can assume values of between −1 and +1, with 0 denoting no correlation.

Our study explores the leadership skills and strengths of the game players, with particular focus on the four core Flow-promoting leadership skills and their interrelation and connection to the other measured skills.

Results: the interrelatedness of flow-promoting leadership skills

Table 1 presents the descriptive statistics for the percentage scores for the 29 leadership skills, sorted in alphabetical order, measured during the first game round of 7931 participants.

The seven highest leadership average scores represent the skills most often used, as follows: information gathering (scoring 72.3), emotional intelligence (71.8), leaders' ability to get involved with their team (69.8), giving feedback (69.0), motivation (68.7), recognizing subordinates' personal strengths (67.9) and having a future orientation (67.7). Three of the four least used leadership skills, based on the averages, were time-related skills: time-pressured decision-making (56.0), time management skills (56.1), and the skill of prioritizing (56.5), with being assertive (57.9) also receiving a low score.

Table 2 lists the strongest correlation values. To give a more concise overview of the connections among the leadership skills that we observed, we retained those skills with a Pearson correlation greater than 0.5, and with a correlation to at least three of the four Flow-promoting skills. The strongest correlation is 0.700 between the two skills of Recognizing personal strength and Balancing. These two leadership skills together represent the two fundamental dimensions or axes of Csikszentmihalyi's Flow map: The x-axis represents the level of skills required for completing an activity (i.e. "integration"), while the y-axis signifies the challenge level (i.e. the "complexity" of a task).

Our research data also strongly support the conceptual construct that all four Flow-promoting leadership skills are strongly interrelated. The weakest connection (0.447) was found between Strategic thinking and Balancing skills, albeit this was only somewhat weaker than the average score. This indicates that Strategic Thinking skills focus on the longer-term perspective, while the Balancing skill of leaders tracks more immediate results and operative outcomes. Leadership requires integrating both skills, one of which responds to dynamic changes within a team and concreate activities, the other which pursues the enhancement of competitive advantage in relation to an extended, strategic time horizon.

Table 1. Descriptive statistics for 29 leadership skill scores ($n = 7931$ global players' first game round).

	Minimum	Maximum	Mean	Std. deviation
Active listening	24	100	63.49	11.507
Analytical skill	18	94	64.19	11.286
Assertiveness	12	89	56.01	11.237
Balancing skill[a]	17	100	64.63	10.792
Building engagement	27	91	66.77	8.885
Business-oriented thinking	22	92	61.50	9.367
Communication	15	100	64.39	11.458
Conflict management	29	92	61.95	9.163
Delegating	11	100	61.59	15.687
Diplomacy	20	100	66.00	10.662
Emotional intelligence	26	100	71.83	9.686
Empowerment	8	100	61.22	14.180
Entrepreneurship (Risk-taking)	20	100	65.91	11.793
Execution	20	95	62.16	12.222
Feedback[a]	18	100	68.95	11.356
Future orientation	15	100	67.66	10.236
Information gathering	24	100	72.34	10.565
Intuitive thinking	19	95	62.17	10.031
Involvement	20	100	69.82	10.999
Motivation	23	96	68.68	10.848
Organizing	21	100	66.76	11.059
Prioritizing	11	95	56.08	10.446
Time-pressured decision-making	12	100	57.94	11.575
Recognizing personal strengths[a]	25	100	67.93	10.194
Social dynamics	26	96	66.82	9.350
Stakeholder management	0	100	63.79	14.526
Strategic thinking[a]	22	100	62.87	10.243
Teamwork management	14	95	61.70	10.242
Time management	0	100	56.50	16.010
Valid N (listwise)				

[a]A flow-promoting leadership skill.

Active listening skill was included in the main correlation table because of their strong connection (0.638) to the balancing skill of a leader. Our research results seem to underpin the notion that a good leader uses their active listening skills to better understand the communication of subordinates, and thus has better judgment in relation to finding challenges that are in balance with followers' skills. The leadership skill of understanding the social dynamics in an organization is strongly correlated to feedback (0.615) and recognizing personal strengths (0.514), but is correlated to balancing skills only minimally (0.004) below the benchmark value of (0.5). Thus, it will be included in the analysis.

Table 2. Correlation table of the four flow-promoting leadership skills.

	Strategic thinking	Feedback	Recognizing personal strengths	Balancing skill
Active listening	.295**	.464**	.468**	.638**
Balancing skill	.447**	.611**	.700**	1.00
Building engagement	.543**	.598**	.663**	*.741**
Business-oriented thinking	.511**	.523**	.435**	.528**
Emotional intelligence	.464**	.638**	.591**	.710**
Entrepreneurship (Risk-taking)	.535**	.590**	.693**	.621**
Feedback	.560**	1.00	.632**	.611**
Future orientation	.714**	.707**	.621**	.547**
Motivation	.410**	.586**	.657**	.729**
Recognizing personal strengths	.522**	.632**	1.00	.700**
Social dynamics	.428**	.615**	.514**	.496**
Strategic thinking	1.00	.560**	.522**	.447**

**Correlation significant at the 0.01 level (two-tailed).

Discussion

Exploration of the major correlations of the Strategic thinking skill reveals the strongest connection with Future-orientation (0.714); that is, the skill to guide the organization, the team, and individuals in line with a long-term future horizon towards a more distant organizational vision. The second strongest correlation (0.560) associated with Strategic thinking was Feedback skills (also an FPL).

The strongest correlation of Feedback skill was with leaders' ability to have a future orientation (0.707): Giving concrete, actionable feedback must always be guided by and in line with the more abstract fundamental values and visions of the organization. Merely functionalistic, short-term feedback cannot induce more Flow and convey the meaning of work to subordinates. Amongst the other three FPL skills, the skill of Feedback is most strongly correlated to leaders' ability to Recognize personal strengths (0.632).

The skill of Recognizing personal strengths, the third Flow-promoting skill, is strongly correlated to the leader's skill of finding the right Balance (0.700). Together these skills map out the Flow Zone, where tasks are neither too difficult nor too easy, but optimal and stimulating, thereby creating the scope to apply one's personal strengths and to gradually develop skills. Figure 5 gives an overview of the 27 leadership skills sorted by their relationship to these two Flow-promoting skills.

Our data shows that leaders who are strong at identifying a person's strengths also have strong Entrepreneurial skills (0.693). By exploiting and utilizing the pre-existing human skills portfolio they also enhance and promote future organizational competitiveness. An organization in which employees' skills are recognized enables leaders to exercise their own skills to Build engagement (0.663): by

	Strongly related to recognizing personal strengths (r ≥ 0.7)	(0.55 < r < 0.7)	(0.45 < r ≤ 0.55)	Weakly related to recognizing personal strengths (r ≤ 0.45)
Strongly related to balancing skill (r ≥ 0.7)	None of the 27 skills related both simultaneously (r ≥ 0.7)	building engagement, motivation, emotional intelligence		
(0.55 < r < 0.7)		entrepreneurship (risk-taking), feedback	active listening, empowerment	
(0.45 < r ≤ 0.55)		future orientation	social dynamics, timely decision making, intuitive thinking	business oriented thinking, diplomacy, execution, organizing
Weakly related to balancing skill (r ≤ 0.45)			strategic thinking, delegating	conflict-management, stakeholder management, communication, analytical skill, time management, teamwork management, involvement, prioritizing, information gathering, assertiveness

Figure 5. Overview of leadership skills by their relationship to recognizing personal strengths and balancing skills (Authors' own compilation).

understanding a person's abilities and skills the latter can delegate subjectively meaningful activities and opportunities to subordinates to unfold their individual abilities – thus their skill of motivating from inside and in line with the longer-term goal. These leaders also demonstrated a high level of Motivation skills, involving applying influence to employees from the outside and with shorter-term effects (0.657).

Conversely, leaders who are highly skilled at finding the right Balance of challenges (Balancing skill) scored high on their ability to Recognize individuals' strengths (0.700). The strongest correlation here was found with the skill to Build engagement (0.741) in employees, but to offer them work opportunities which are optimal for their current level of abilities and thus enable Flow experience. Flow is characterized by perceiving an activity as being highly meaningful and engaging. Balancing skill is also strongly correlated (0.729) with Motivation. This seems to support the general notion, and Csikszentmihalyi's fundamental theory, that a well-balanced activity can per se be a motivating factor. The correlation with Emotional intelligence skill is 0.710: charging a subordinate with the right number of tasks, duties, and challenges requires a leader's ability to relate to the other person's inner emotions, such as feeling enthusiastic (or the lack thereof) whilst completing work-related tasks.

Figure 5 shows that building engagement, motivation and emotional intelligence show the strongest connections to the Flow-promoting skills of recognizing personal strengths. Furthermore, our research analysis revealed a strong connection between entrepreneurship/risk-taking and feedback leadership skills on the one hand and the ability of a leader to recognize the personal strengths and skills of a follower.

These skills are often considered to be those leadership skills, that define the style of interaction, organizational culture and work atmosphere.

At the same time the style of decision making, for example, analytical skills, information gathering skills, and the style of getting work done, such as execution skills, organizing skills and time management, have not shown relevant connection to the core Flow-promoting skills.

All these analyzes help us to better understand FPLs and explore the relationships between leadership skills based on the results of real players. Through this we can build a picture of skill portfolios and generate ideas about how to develop leadership development training.

Summary and conclusions

We have demonstrated the concrete and effective application of serious gaming technology for the measurement and analysis of leadership skills, including the four that promote a greater Flow experience for employees at work. We show that, beyond the traditional methods of measuring leadership skills (primarily self-assessment via questionnaires and external rating via an assessor), a third method can be effectively used. The key scientific result of the work is the introduction of game-based psychometrics that can be used to effectively explore complex leadership skillsets and correlations thereof.

Virtual stories and decision dilemmas in serious games enable the unbiased, objective collection and reporting of data about gamer decisions. Expert coding and decoding of the underlying patterns of leadership skills and resulting leadership styles and preferences can be used to compare strengths and weaknesses with other players in the same cohort or across larger global populations. The four Flow-promoting leadership skills by Csikszentmihalyi have thus been more deeply explored and empirical support for their interrelatedness has been provided, and a further set of strongly associated leadership skills revealed.

The unique dataset contains the leadership skill scores of several thousand individuals from across the globe measured via FLIGBY®, a Flow-leadership development serious game. The strongest connection was revealed between the leadership skill of discovering a person's personal strengths and the skill of creating the right balance between challenge and skill level. This confirms the hypothesis of Flow-promoting leadership theory: a leader should be aware of followers' abilities

and skills so as to better motivate them by assigning those tasks which are sufficiently challenging yet can be accomplished. The empirical analysis confirmed the researchers' hypothesis and demonstrated a clear and strong connection between the four Flow-promoting leadership skills. Furthermore, the study revealed the most significant interconnections among the 29 leadership skills, and among these the core FPL skills.

Implications for theory and research

The mental state of Flow has been associated with positive effects and outcomes at the workplace (engagement, creativity, learning, efficacy, well-being and happiness), thus representing a new leadership theory (Buzady et al., 2019; Kopperud & Straume, 2009). Our results confirm the effectiveness of using serious games for learning, with multiple pedagogical benefits: beyond creating an engaging digital-virtual learning environment, serious games can be used for: (a) measuring leadership skills in a new way, (b) comparing skill profiles across relevant cohorts and global benchmarks, (c) enhancing leadership skills, and (d) generating data that can be used to explore the deeper relationships between the four Flow-promoting leadership skills among the 29 measured leadership skills. The current study draws attention to the significance of exploring the leadership process of creating Flow at the workplace in the wider context of leadership skill sets.

Implications for practice

The relevance for practice of the present research is the demonstration that leadership skills can also be measured within the non-intrusive, decision-based environment of an educational serious game. Furthermore, the use of serious games can be instrumental in analysis, benchmarking on a global basis or across industry segments, and for comparing the game results and leadership skills of players. The results highlight a means of training participants in development and learning, and also a way of providing the academic research community with novel datasets and opportunities for obtaining new insights, as outlined in our research. This specific serious game was designed for the promotion of Flow theory in a business context and for training the relevant 29 leadership skills.

The current study has shown that the measurement of leadership skills via serious gaming represents a novel way of auditing the skill sets of all manager-leaders at all organizational levels. The Flow-promoting leadership skills framework provides practitioners with guidance for developing the level of happiness, creativity, engagement and meaningful work in their organizations through training and development using serious gaming techniques (Buzady et al., 2019; De Freitas & Routledge, 2013).

Limitations and future research

Further academic research is underway to explore the effects on the development of leadership skills when participants repeat the serious game process: namely, it explores which skills are more susceptible to being developed via gaming. Also, the present study does not explore the differences across the global and regional clusters from where data was collected. Future research is needed to explore the differences in leadership skills and styles in major global regions. Similarly, more scientific insight can be expected from follow-up studies which explore the effects of independent variables, such as players' age, gender, years of leadership experience, and their leadership aspirations for the future, the influence of their functional roles and that of the industry segment of their organization, its location, or the impact of their home country location.

The current study contributes to the limited research on the application of serious games to measuring skills and the application of Flow-promoting leadership theory to the practice of creating more meaningful workplaces. Talent management and attempts to develop organizational

interventions and leadership skills can use these results to more effectively deliver training and development in innovative ways. The long-term effects of such gamified interventions and the application of the expected results need to be explored through longitudinal studies.

Disclosure statement

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