



Full length article

Grit in the path to e-learning success

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ARTICLE INFO

Article history:

Received 21 April 2016

Received in revised form

12 September 2016

Accepted 11 October 2016

Keywords:

e-learning systems

e-learning success

Success determinants

Grit

Perseverance

Stamina

ABSTRACT

E-learning systems are emerging in many settings of our society. Schools, universities, and several other organizations use these systems. E-learning systems allow learning anytime and anywhere. This medium may seem to be the answer to all learning barriers, but the effect of non-cognitive skills on the success of e-learning systems is yet to be explored. Latest studies demonstrate that students with high grit levels, stamina in pursuing long term objectives, achieve better results in learning. In our study we propose a theoretical model studying grit as a determinant of e-learning systems success. The study was conducted on a sample of university students' sample, and a theoretical model was validated using structural equation modeling (SEM). Results indicate that grit has positive effects on satisfaction and in students' individual performance. The results help to improve e-learning strategies and to understand e-learning success, explained by students' skills and systems characteristics.

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1. Introduction

At no time before, in the history of humanity, there was such a wealth of information freely available, available to anybody that wishes to learn any particular subject. The options are endless and access immediate. Through the developments in telecommunication technologies distance, learning became e-Learning, and with this the learning environment for the learner changed dramatically. Not only the interaction between the learner and instructor became easier and more efficient, but also time and space limitations were significantly mitigated. Today, Internet access guarantees the possibility of a world-class education at minimal, if not free, costs. There is no question that, in coming years, education will change; the challenge is to make sure this change will positively affect world development. To be able to change the world for the better e-learning needs to be effective, and to improve its performance we need to understand the factors affecting it.

The possibility of customizing the learning environment, content, pace, and sequence, accordingly to the learner's characteristics and learning style, can be a significant asset to promote eLearning

effectiveness. To make progress in personalizing the eLearning experience, we first need to understand the impact of different psychological traits of the learner in his/her performance. The ability to understand the particular needs of the learner and personalize the learning experience accordingly constitutes a significant challenge, but will surely produce a more effective learning experience.

Learning is a long-term process; the outcomes are perceived only after students have invested significant amounts of time and effort. The ability to sustain interest, and invest hard work over extended periods of time, varies significantly from individual to individual. The impact of momentary failure in this investment also varies considerably in students. Successful students often taste failure, but they also know that perseverance and constant effort lead to their goals. Studies demonstrate that even if students pursue long-term goals, they reveal different performances due to individual psychological characteristics (Duckworth & Gross, 2014). A recent study's findings show that gritty students may outperform the most talented peers (Duckworth, Peterson, Matthews, & Kelly, 2007). Grit is defined as "the perseverance and passion for long-term goals" (Duckworth et al., 2007, p. 1087). Grit entails resolution, fortitude, resilience, perseverance, tenacity, and stamina. The Grit concept is related to personal intrinsic motivation in a continuous effort for pursuing a path, apart from the adversities along the way. Grit is a non-cognitive individual characteristic reflected in the mental capacity and stamina in the pursuit of long-

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term objectives. Grit has been studied in the fields of psychology, health, and educational research. Psychological studies demonstrate that students with high grit levels achieve better results in learning (Duckworth & Gross, 2014; Duckworth et al., 2007). To date and to the best of our knowledge, no study has considered the importance of grit in e-learners' success. Understanding the impact of users' individual characteristics may lead to a better notion of the determinants of e-learning systems success.

Inspired by the research gap mentioned above and in order to answer the proposal of several authors suggesting the need to further explore the effects of grit in other domains (Duckworth & Quinn, 2009; Duckworth, Grant, Loew, Oettingen, & Gollwitzer, 2011; Ivcevic & Brackett, 2014) we conducted a study on the effects of Grit in e-learning systems success. Assuming that e-learning systems are not a panacea in the learning process, we study the impact of Grit on e-learning systems use and on learners' satisfaction. As a main contribution, this study integrates Grit into the DeLone and McLean (1992) information systems' success model. The DeLone & McLean model is an information system success model that has not been applied to the issue of student long-term resilience. Our main goal is to understand the various impacts of Grit in learners' satisfaction and use of e-learning systems. This study also studies the impact of Grit in students' perseverance and consistency of interest in the e-learning context.

The paper has seven sections. The first two sections present the theoretical foundations of Grit in education, and also a review of e-learning systems success. In the third section we propose a theoretical model. The fourth and fifth sections describe our empirical study conducted with 383 students from various universities and present the results. The last two sections are the discussion and conclusions.

2. Grit concept and earlier studies

The grit concept was introduced by Duckworth et al. (2007). According to the authors "Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress." (Duckworth et al., 2007, p. 1087) Studies reveal that Grit is highly related with age and with educational level (Duckworth & Quinn, 2009; Duckworth et al., 2007). Grit has been studied in several contexts, mainly in education and training, Table 1 summarize various empirical studies with grit. In the field of education Grit has been shown to be a reliable predictor of better learning outcomes. Grit is also associated with age and education level among other students' characteristics.

From Table 1 we can infer that grit was studied combined with other cognitive measures, e.g., IQ or even aptitude tests, and non-cognitive measures, such as perseverance and individual stamina (Muller, 2015). It is also important to stress that grit is not self-control (Duckworth & Gross, 2014). According to these authors self-control is a skill or a capacity, and is associated with positive life outcomes, and as with other skills, students can learn to improve and develop this skill. Grit is related to motivation and persistence, despite the ups and downs of life. Grit in learning can be illustrated as a turtle in a race, and compared with the hare, has persistence and is goal directed. Contrary to the turtle, the hare only runs quickly and seeks short-term results. Duckworth and Gross (2014) suggest that self-control and grit can both be predictors of success, but these two non-cognitive measures should be studied separately.

2.1. E-learning systems success

Success in information systems has been measured in different ways. In the 1980s success meant a real implementation of a system, focusing on the technical aspects of technology (Rockart, 1982). While some authors studied IS success regarding system

quality, system usage, user behavior, and satisfaction (Ives & Olson, 1984). Raymond (1990) measured success through user satisfaction provided by the efficient use of a system. The latest studies, reported by many authors, assess IS success using systems quality, information quality, services quality, user satisfaction, and perceived user benefits (DeLone & McLean, 1992, 2003b; DeLone, 1988; Seddon, Staples, Patnayakuni, & Bowtell, 1999). Success is related to the adoption and continuous usage of systems in a post-adoption phase (DeLone & McLean, 1992).

DeLone & McLean (1992) propose tests and verify six related dimensions of success: system quality (SysQ), information quality (IQ), use, user satisfaction (US), individual impact (II), and organizational impact. One of the main theories on which this model is based is a theory of planned behavior (TPB) (Ajzen, 1991). TPB models how attitudes and behavior influence intention. The TPB model explains the basis of human behavior, in which individuals lead their actual behavior by perceived behavioral, normative conduct, and individual intentions.

Information quality is measured by completeness, timeliness, accuracy, relevance, and steadiness of information output (DeLone, 1988; DeLone & McLean, 2003a; Petter, DeLone, & McLean, 2008, 2012). Use measures the usage frequency of the output of an information system, measured by the actual number of times that users access the systems, during a week or during the day. Use also reflects the self-perception of frequent usage (Davis, 1989; DeLone & McLean, 2003a; Urbach, Smolnik, & Riempp, 2010). System quality is the information system processing and the technical adequacy. System quality is measured by functionality, ease-of-use, reliability, data quality, portability, integration, and the importance, usability, availability, reliability, adaptability, and response time (DeLone & McLean, 2003a; Petter, DeLone, & McLean, 2012). Service quality is considered determinant to the system usage, and also leads to users' satisfaction. Service quality measures satisfaction, hence to improve the quality of future interactions (Pitt, Watson, & Kavan, 1995). When users grade service quality, they compare their expectations and their actual use of the system (Conrath & Mignen, 1990). Service quality evaluates the service provided by the system, organization, and department. It can be measured by tangibility, trustworthiness, responsiveness, and empathy. As in any other service, the quality of the system is related to the support given to the client (DeLone & McLean, 2003a).

Information systems success theory (DeLone, 1988; Igbaria, Zinatelli, & Cavaye, 1998; Louis; Raymond, 1985; Yap, Soh, & Raman, 1992) indicates that one of the success measures is individuals' satisfaction from using a system. Since the success is usually measured using variables that are connected to a prior systems' usage, users' satisfaction is given by the user according to her/his experience of the system, and can be measured according to the users' perception of the e-learning systems. Perceived user satisfaction can be measured according to a usage experience of an information system (DeLone & McLean, 2003b; Sun, Tsai, Finger, Chen, & Yeh, 2008).

E-learning systems studies are mainly focused on adoption of technology. Throughout the years several authors (Chen & Liu, 2013; Lee & Lee, 2008; Lee, Cheung, & Chen, 2005; Lin & Bhattacharjee, 2010; Schoonenboom, 2014) have verified the technology adoption model (Davis, 1989) and a theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003). Other studies used the DeLone and McLean IS success model in the e-learning context (Aparicio, Bacao & Oliveira, 2016; Heo & Han, 2003; Mohammadi, 2015; Wang, Wang, & Shee, 2007).

From the various studies, we find that none of these earlier investigators studied the impact of non-cognitive characteristics on e-learning. According to Duckworth et al. (2007) it is important to study non-cognitive skills on learners' success over cognitive skill, such as IQ because there are equal success levels spread across different intelligence capacities.

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