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Measuring E-Learning System Success (Research In Progress)

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MEASURING E-LEARNING SYSTEM SUCCESS

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Abstract

Education is considered to be one of the sectors that have been radically affected by developments in information technology. E-learning is believed to be the main outcome of adopting and using the new and more advanced information technology in the education sector. In spite of this rapid growth in the e-learning field there still exists a range of issues facing the stakeholders of e-learning systems. One of the key issues is measuring e-learning system success. Although considerable attention has been paid to the information systems success issue, there remain arguments about the factors which are most effective in measuring information system success. The issue of measuring information system success has an impact on evaluating e-learning systems success as well.

This study aims to fill this void by proposing an evaluation methodology model to assess e-learning systems success. The contribution of this study is the proposed model to assess e-learning systems success. The model is based on a thorough review of the e-learning success literature and existing IS success models. A range of stakeholders such as Academic staff, students, and ICT staff are considered in this model.

Keywords: E-learning systems, evaluation of system success.

1 INTRODUCTION

1.1 Background of study

Information technology (IT) has become an essential factor in organisational success due to its critical role in enabling the achievement of individual and organizational goals. The introduction of IT is no longer limited to back-office business functions but has grown to include the core processes in health, education, transport, banking, and other fields.

The education sector is considered to be one of the sectors that have been radically affected by developments in information technology. Substantial amounts of money have been spent in systematic development of technology infrastructure (Georgina & Olson, 2008).

E-learning is believed to be the main focus of adopting and using the new and more advanced IT in the education sector. These e-learning systems have also been adopted by non-educational organizations to train their employees (Wang & Wang, 2009). The introduction of e-learning systems can enable non-educational organizations to receive valuable benefits. For example, IBM saved USD200 million in 1999, providing five times the learning at one-third the cost of their previous methods (Strother, 2002).

In higher education, using e-learning systems is believed to be one of the most crucial developments due to the use of IT in this arena in the last decade (McGill & Klobas, 2009). In the USA, 90% of 2-year and 89% of 4-year public education institutions offered distance education courses in 2000-2001 with enrolments of 1,472,000 and 945,000 respectively out of total enrolment of 3,077,000 (Holsapple & Lee Post, 2006). Furthermore, learning management systems (LMSs) have been adopted by 95% of all higher education institutions in the United Kingdom (McGill & Klobas, 2009). It is worth mentioning that transnational courses are delivered by most Australian universities through using educational software (Shurville, O'Grady, & Mayall, 2008).

In spite of this rapid growth in the e-learning field there still exists a range of issues facing the stakeholders of e-learning systems. One of the key issues is measuring e-learning system success. In the context of e-learning systems, this issue is considered more complicated because the e-learning term is used with different points of view. Cohen and Nycz (2006) state that "E-learning can be difficult to understand because different authors use the term differently" (p.23). This lack of evaluation of e-learning systems success is believed to be a central concern for the researchers and the stakeholders of these systems. According to Ardito et al. (2006) an effective methodology to evaluate e-learning system success is still unavailable. Furthermore, the issue of lack of an effective methodology to evaluate e-learning system success is no longer restricted to higher education field but now extends to the non-educational organisations. Wang et al. (2007) state that " Little research has been conducted to assess the success and/or effectiveness of e-learning systems in an organizational context" (p.1792).

1.2 Motivation for study

E-learning systems are considered to be multidisciplinary so evaluation of these systems should be from different points of view (Ozkan & Koseler, 2009). Before 1990, the evaluation of e-learning systems success received little attention from researchers. According to McGorry (2003), the main direction of research was the differences between traditional and distance education. After 1990, the direction of research in this field started to focus on the issue of the quality of e-learning (McGorry (2003); MacDonald et al. 2005). Quality is considered to be an essential factor in assessing e-learning system success but there are other factors that should be considered in the evaluation process. In the information systems field, the stakeholders are believed to be a significant factor in evaluating information system success (Shee & Wang, 2008). In the context of e-learning systems, studies continue to ignore the issue of multiple stakeholders because most of the research has focused on single stakeholders, such as students.

This direction of research led to scant attention to establishing a comprehensive measurement framework that can evaluate e-learning systems success and ensure the stakeholders achieved their goals. This study aims to fill this void by proposing an evaluation model to assess e-learning systems success. A range of stakeholders such as Academic staff, students, and ICT staff are considered in this model. The diversity of stakeholders who evaluate e-learning systems provides a holistic picture about these systems and their outputs.

1.3 Study problem

A critical issue facing IT projects is their high rate of failure. E-learning systems also encounter the problem of failure. According to Rovai and Downey (2009), the British Government spent $113 million in 2000 to establish an e-learning project called the United Kingdom e-University (UKeU). In 2004, the Government announced that UKeU had failed because it did not meet recruiting targets. In another example, the New York University online closed due to economic conditions. The lack of evaluation is believed to be significant reason for failure e-learning systems. According to McGorry (2003) many educational institutions have not considered this important issue of evaluating e-learning systems. Therefore, these systems need to be assessed continuously to make sure that the outputs meet users' needs. However, there are some dilemmas in measuring the success of e-learning systems and in determining the most effective technique to undertake this process (McGorry, 2003); (Wang, et al., 2007); (Ardito, et al., 2006). Thus, two problems are investigated by this research:

1. What are the main factors considered to be important in measuring e-learning system success?
2. Is the model to measure e-learning system success proposed in this study valid and reliable to evaluate e-learning systems from different points of view (i.e. with different users)?

1.4 Significance of study

The process of evaluating e-learning system success is significant because it assists in managing, maintaining, and developing these systems and in diagnosing the problems that need to be solved. The differences in goals of stakeholders create a difficulty in assessing the success of e-learning systems. Furthermore, most of the previous research that has dealt with the e-learning systems success issue was limited to one type of stakeholder i.e. students, and ignored the other types of stakeholders. The significance of this study is the attempt to identify the factors impacting on the success of e-learning systems and place these factors in a proposed model. Additionally, the model provides an evaluation of the success of e-learning system with different stakeholders through three instruments which have been developed to achieve this purpose. The results of this study are considered significant for the University because they provide University management with a clear picture about e-learning systems in this university through opinions of three groups of stakeholders: academic staff, students, and ICT staff.

1.5 Study contribution and objectives

The contribution of this study is the proposed model to evaluate e-learning systems success. This new model is believed to be holistic because different perspectives have been considered in relation to technical, user attitude, marketing and organisational. Another contribution is related to the net benefits factor. Different views of value are employed to measure the net benefits of e-learning systems dealing with customer value, organizational value, and society value. Finally, IT infrastructure has been included in this model. To this author's knowledge, this factor has not been used previously as a construct to measure IS success. The validity and reliability of this factor to measure e-learning success is tested in the context of this model.

This study provides universities with a model and instruments enabling them to evaluate e-learning systems success. Moreover, the results of the study assist the University and other institutions that use e-learning to identify the problems and shortfalls in the success of e-learning systems.

The objectives of this study are to identify those factors which affect e-learning systems success and place them in a holistic model; to determine the type and power of relationships between those factors in the context of the proposed model, and to measure the direct and indirect effects between constructs of the study model; and to test the validity and reliability of the proposed model and to confirm that the model is suitable to measure the success of e-learning systems from different points of view. After a brief review of the literature, the proposed model is presented, the methodology is described, and the conclusion summarises progress to date and future work.

2 LITERATURE REVIEW

The term *e-learning* is used by many researchers and consensus on its definition has not been achieved (Lee, Yoon, & Lee, 2009). Engelbrecht (2005) restricts e-learning to distance-mode delivery: "the use of electronic media (the internet, DVD, CD-Rom, videotapes, television, cell phone, etc.) for teaching and learning at a distance" (p. 218). Whereas in the context of active learning, Lee et al. (2009) do not impose such a restriction, defining e-learning as "Web based learning which utilize web-based communication, collaboration, multimedia, knowledge transfer, and training to support learner's active learning without the time and space barriers" (p.1321). We accept the latter definition, recognizing that in many institutions, e-learning systems are used by on-campus students as well as distance-mode students.

Different criteria in evaluating e-learning system success have appeared because of differences in approaches adopted by various authors as to the term *e-learning* (Ozkan & Koseler, 2009). The studies which have dealt with this issue can be classified into four approaches.

2.1 Technology acceptance model approach

The technology acceptance model (TAM) approach is considered to be a common application in the IS field. The main purpose of using this approach is to measure the acceptance of using technology and the success of these technologies. Roca et al. (2006) combined Expectancy Disconfirmation theory and TAM to create a new model to measure e-learning continuous intention. Martinez-Torres et al. (2008) adopted TAM and made essential changes to the constructs of this model. The main purpose of these changes on TAM items is to make them relevant to the e-learning system usage context. The studies which are considered supportive of this approach are conducted by Selim (2007), Abbad et al. (2009), and Ngai et al. (2007).

2.2 User satisfaction approach

User satisfaction has received considerable attention from the researchers in the IS field. This attention included e-learning systems. User satisfaction has been considered as a measurement to assess e-learning system success. Sun et al. (2008) classified the critical factors which drive successful e-learning in six dimensions which are learner, instructor, course, technology, design, and environmental. Studies conducted by Shee and Wang (2008), and Wu et al. (2010) are considered to be supportive of this approach.

2.3 E-learning quality approach

Studies have and still pay considerable attention to e-learning quality. Also, the quality issue has received attention from educational institutions such as the Western Interstate Commission for Higher Education (WICHE), and the Institute for Higher Education Policy (Frydenberg, 2002). The contributions which adopted this approach focused on the quality of e-learning system as a whole and not limited to service quality only. MacDonald et al. (2001) have proposed a model called the Demand-Driven Learning Model (DDLM). DDLM was established relying on five factors which were considered to be essential to creating e-learning quality in higher education. The constructs of this model are structure, content, delivery,

service, and outcome. Studies by McGorry (2003), MacDonald and Thompson (2005), and Lee and Lee (2008) are believed to be supportive of this approach.

2.4 DeLone and McLean model approach

The DeLone and McLean model is a common technique used to assess IS success. E-learning systems are considered to be the most important IT projects in universities (Lee, et al., 2009). However, the evaluation of these systems is still facing problems as there is a lack of measurements to evaluate the success of these projects. The DeLone and McLean model is believed to be one of the most important measurements which can be used to address this issue in the e-learning field. Studies conducted by Lin (2007), Holsapple and Lee-Post (2006), and Lee-Post (2009) are believed to be supportive of this model.

3 PROPOSED MODEL AND HYPOTHESES

A causal approach has been adopted in this study. Based on the components of this approach, a proposed model has been designed. Figure 1 shows this model.

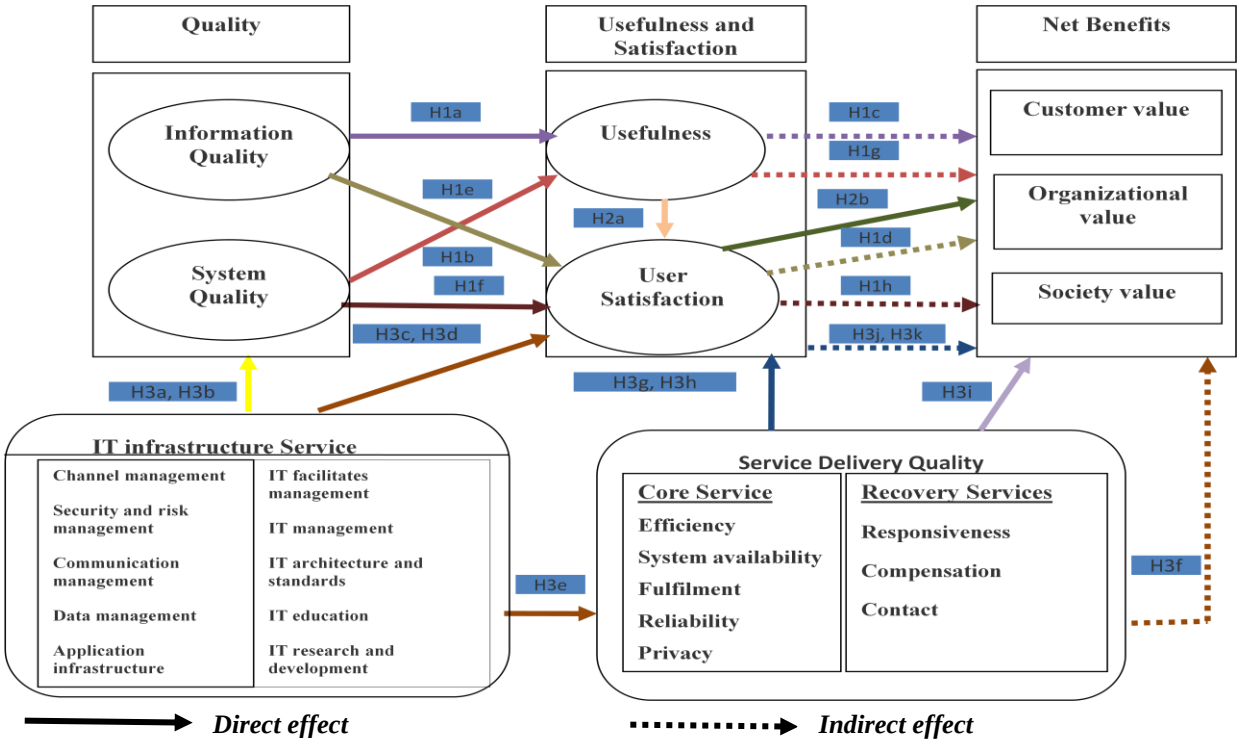

Figure 1. The proposed model to measure e-learning system success.

The model of the study has been established based on the relationships between the constructs; therefore, there are 21 relationships to be tested. These relationships are formulated as hypotheses. The hypotheses are listed in Table 1.

H1	**Hypotheses of quality variables.**		**H3**	**Hypotheses of service delivery and IT infrastructure services.**
H1a	Information quality directly affects usefulness.		H3a	IT infrastructure directly affects information quality.

H1b	Information quality directly affects user satisfaction.		H3b	IT infrastructure directly affects system quality.
H1c	Information quality indirectly affects net benefits via usefulness.		H3c	IT infrastructure directly affects usefulness.
H1d	Information quality indirectly affects indirectly net benefits via user satisfaction.		H3d	IT infrastructure directly affects user satisfaction.
H1e	System quality directly affects usefulness.		H3e	IT infrastructure directly affects service quality delivery.
H1f	System quality directly affects user satisfaction.		H3f	IT infrastructure indirectly affects net benefits via service quality delivery.
H1g	System quality indirectly affects net benefits via usefulness.		H3g	Service quality delivery directly affects usefulness.
H1h	System quality indirectly affects net benefits via user satisfaction.		H3h	Service quality delivery directly affects user satisfaction.
H2	**Hypotheses of usefulness and user satisfaction.**		H3i	Service quality delivery directly affects net benefits.
H2a	Usefulness directly affects user satisfaction.		H3j	Service quality delivery indirectly affects net benefits via usefulness.
H2b	User satisfaction directly affects net benefits.		H3k	Service quality delivery indirectly affects net benefits via user satisfaction.

Table 1. List of hypotheses of study.

The hypotheses proposed in the model are justified by previous studies as listed in Table 2.

Factors	Information Systems References	E-learning Systems References
Information Quality	Bailey & Pearson (1983), Miller & Doyle (1987), DeLone & McLean (1992) (2003), Seddon (1997), Skok et al. (2001), Rai et al. (2002), Kahn et al. (2002), Lee et al. (2002), McKinney et al. (2002), Bharati & Berg (2005), Iivari (2005), Byrd et al. (2006), Ifinedo (2006), Nicolaou & McKnight (2006), Stvilia et al.(2007), Stvilia et al. (2008), Price et al.(2008), Gable et al. (2008), Wang (2008), Zhi-yong et al. (2009), Gorla et al. (2010), Gorla & Lin (2010), Landrum et al. (2010).	Holsapple & Lee Post (2006), Roca et al. (2006), Wang et al. (2007), Ozkan & Koseler (2009),Wang & Wang (2009), Ramayah et al. (2010).
System Quality	Bailey & Pearson (1983), Mahmood (1987), DeLone & McLean (1992) (2003), Wang & Strong (1996), Seddon (1997), Skok et al. (2001), Rai et al. (2002), McKinney et al. (2002), Iivari (2005), Bharati & Berg (2005), Byrd et al. (2006), Ifinedo (2006),Wang (2008), Zhi-yong et al. (2009), Gable et al. (2008), Landrum et al. (2010), Gorla et al. (2010), Gorla & Lin (2010).	Holsapple & Lee Post (2006), Roca et al. (2006), Wang et al. (2007), Liaw (2008), Ozkan & Koseler (2009),Wang & Wang (2009), Ramayah et al. (2010), McGill & Klobas (2009).
Usefulness	Davis (1989), Seddon (1997), Venkatesh & Davis (2000), Rai et al. (2002), Hung (2003), Yang (2005), Byrd et al. (2006), Sabherwal et al. (2006), Landrum et al. (2007), Venkatesh & Bala (2008), Larsen et al. (2009), Landrum et al. (2010).	Arbaugh (2000), Pituch & Lee (2006), Roca et al. (2006), Liaw (2007), Martinez-Torres et al. (2008), Lee-Post (2009), Wang & Wang (2009), Abbad et al. (2009).
User Satisfaction	Bailey & Pearson (1983), Ives et al. (1983), Baroudi et al. (1986), Lehman (1996), Doll & Torkzadeh (1988), DeLone & McLean (1992) (2003), Etezadi-Amoli & Farhoomand (1996), Seddon (1997), Skok et al. (2001), Rai et al. (2002), Xiao & Dasgupta (2002), McKinney et al. (2002), Xiao & Dasgupta (2005), Ong & Lai (2007), Wixom & Todd (2005), Iivari (2005), Sabherwal et al. (2006), McGill & Klobas (2008), Wang (2008), Gable et al. (2008), Landrum et al. (2010), Udo et al. (2010).	Arbaugh (2000), Roca et al. (2006), Holsapple & Lee Post (2006), Wang et al. (2007), Shee & Wang (2008), Sun et al.(2008), Adeyinka & Mutula (2010), Wu et al. (2010), Naveh et al. (2010).

Factors	Information Systems References	E-learning Systems References
Customer Value (Internal)	Zmud (1983), Snitkin & King (1986), Aldag & Power (1986), Skok et al. (2001), Iivari (2005), Ifinedo (2006), Davern & Wilkin (2010).	Wang et al. (2007), McGill & Klobas (2008).
Customer Value (External)	Hitt & Brynjolfsson (1996), Shun & Yunjie (2006), Wang (2008), Chang et al. (2009), Kuo et al.(2009).	Chiu et al. (2005), Holsapple & Lee Post (2006), Adeyinka & Mutula (2010), Martinez-Torres et al. (2008).
Organizational Value	Benbasat & Dexter (1986), Miller & Doyle (1987), Hitt & Brynjolfsson (1996), Seddon (1997), Mirani & Lederer (1998), Amit & Zott (2001), Skok et al. (2001), Shang & Seddon (2002), Gable et al. (2008), Tzeng et al. (2008), Gorla & Wong (2010), Gorla & Lin (2010).	Wang et al. (2007).
Society Value	Seddon (1997), Ryan et al. (2002), Tallon et al. (2000).	----------
Service Quality Delivery	Pitt et al. (1995), Dyke et al. (1997), Berry & Parasuraman (1997), Watson et al. (1998), Zeithaml et al. (2000), Liu & Arnett (2000), Cox & Dale (2001), Yoo & Douthu (2001), Zeithaml et al. (2002), Zeithaml (2002), Wolfinbarger & Gilly (2003), Wilkin & Castleman (2003), Landrum & Prybutok (2004), Yang & Fang (2004), Parasuraman et al. (2005), Kettinger & Lee (2005), Yang et al. (2005), Lai (2006), Lee & Kozar (2006), Bauer et al. (2006), Fassnacht & Koese (2006), Hwang & Kim (2007), Cristobal et al. (2007), Loiacono et al. (2007), Rauyruen & Miller (2007), Roses et al. (2009), McManus (2009), Park & Gretzel (2007), Ding et al.(2010), Udo et al.(2010).	Brigham (2001), McLoughlin & Luca (2001), Frydenber (2002), Mcgorry (2003), Chiu et al.(2005), Reid (2005), Oliver (2005), MacDonald & Thompson (2005), Roca et al. (2006), Holsapple & Lee Post (2006), Wang et al. (2007), Lee & Lee (2008), Wang & Wang (2009), Ozkan & Koseler (2009), Ramayah et al. (2010).
IT infrastructure Service	Broadbent & Weill (1997),Weill et al. (2002), Weill & Vitale (2002), Hwang et al. (2002), Murakami et al. (2007), Fink & Neumann (2007), King & Flor (2008), Bekkers (2009), Fink & Neumann (2009), Sobol & Klein (2009), Bhatt et al.(2010), Ramirez et al. (2010), Hicks et al. (2010).	----------

Table 2. List of studies supportive of proposed model.

4 RESEARCH METHODOLOGY

4.1 Research philosophy

The paradigm should be considered before selecting the study approach and method. Epistemological and ontological concepts need to be considered in choosing the study approach and methods (Cater-Steel, 2004). Epistemology can be classified as positivist, interpretive, and critical. For this study, the positivist paradigm is adopted to identify the factors affecting e-learning system success and to evaluate the e-learning system success in higher education. The degree of subjectivity versus objectivity is believed to be the central to the concept of ontology (Cater-Steel, 2004). An objective view is taken in this study by investigating the pertinent factors of e-learning system success, as well as considering various stakeholders' points of view about the effect of factors on the success of e-learning systems.

4.2 Study approach

E-learning systems are facing the critical problem of measuring success of these systems. Based on that, this study raises a number of research questions to investigate the factors which are affecting e-learning systems success. A model is proposed based on these factors. The proposed model is the theoretical basis of this study as well as the contribution of this study in the field of IS. According to James et al. (1982)

"Theory means a set (or sets) of interrelated causal hypotheses that attempts to explain the occurrence of phenomena, physical, biological, social, cultural, or psychological*" (p. 27).* Based on this definition of theory, the causality approach is adopted in this study. The main justification to use this approach is that it provides the ability to show causal relationships among the factors of the phenomena occurring in a physical system (Atoji, Koiso, & Nishida, 2002).

4.3 Research sampling

The research is conducted with three stakeholder groups from the author's University: students, academic staff, and ICT staff. These groups have constant contact with the e-learning system. Their opinions shape a comprehensive picture about e-learning systems. Furthermore, the University is believed to be one of the pioneering universities in the distance education area. The study is limited to this University because studying many different institutions would be prohibitively costly and time-consuming.

4.4 Data collection and analysis

Three online questionnaires are used to collect data from the samples. These instruments are developed using Survey Monkey and the links distributed to the respondents through email. A pilot study is conducted to confirm the structure and content of the survey before conducting the main study. Responses are transferred from Survey Monkey to SPSS and SPSS AMOS. Structural Equation Modelling is the main analysis method to test hypotheses and to identify the direct and indirect effects between the constructs of the proposed model. Furthermore, the reliability of each factor is calculated by using the Cronbach alpha statistic. In addition, Confirmatory Factor Analysis is used to test the validity of the model measurements. Also, the goodness-of-fit overall model is tested.

5 CONCLUSION

E-learning systems are believed to be the most common recent IT applications in higher education institutions. Also, non-educational organisations have adopted these systems to train their employees. However, measuring information systems success is considered to be the main issue in this field. In the context of e-learning systems, this issue is believed to be more complicated because the e-learning term is used with different points of view and from different stakeholders. The previous studies which dealt with this issue used four approaches: TAM, user satisfaction, e-learning quality, and DeLone and McLean model. In spite of these attempts, there remain arguments about the factors which are most effective in measuring e-learning system success.

Based on prior work, a proposed model has been designed to evaluate e-learning system success. Four views have been considered in designing this model: technical, attitude, marketing, and organisational. The causality approach has been adopted to show the causal relationships among the constructs of the model. The study is conducted with three stakeholder groups of the University: students, academic staff, and ICT staff. Three instruments have been designed to collect the data; each one is distributed to a specific stakeholders group. The diversity of their opinions will shape a clear picture about the factors affecting e-learning systems success.

A recognised limitation of this study is the reliance on data from a single institution. Temporal, financial and access constraints restrict the scope of the research sample. However, it is hoped that the proposed model and instruments will be tested and further refined in the future with different institutions and with different platforms of e-learning systems. This work benefits universities and non-educational organisations that use e-learning systems to identify the problems and shortfalls in the success of e-learning systems.

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