

# A Contingent Model for Evaluating Enterprise Systems' Benefits Using Competing Value Approach

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## Abstract

*Enterprise Systems (ES) are complex IT systems adopted by organisations to support business and increased productivity and efficiencies from integration, automation and reengineering of processes, as well as management of large volumes of data. Although investment in ES implementations is large, not all organisations achieve the benefits anticipated from ES implementations. A critical review of literature suggests that contingency factors such as organisational learning and innovation have an impact on ES benefits achieved. The conceptual framework proposed in this paper extends an exploratory study on the impact of organisational learning and innovation on ES benefits realisation using the Competing Value Theory for evaluating ES benefits.*

## Keywords

Enterprise Resource Planning, Enterprise Systems, Contingency Theory, Competing Value Framework, Benefits Evaluation

## INTRODUCTION

Enterprise Resource Planning (ERP) or Enterprise Systems (ES) are large, real-time integrated software packages that provide organisations with modern technological processing ability to support business processes, information flows and businesses analysis (Seddon et al., 2010). ES market have experienced an exponential growth in the last decade with the global market valued at USD24.5 billion, dominated by ES vendor SAP valued at USD6 billion (Gartner, 2013). ES implementations are complex and time consuming (Davenport, 1998), resulting in research directions of: i) ES success and failure (Nah et al.,(2001); Umble et al., (2003); ii) ES benefits (Murphy & Simon, (2002); Shang & Seddon (2000); and iii) business transformation (Willis and Willis-Brown, 2002; Davenport et al., 2004). However, a large portion of earlier research on ES is focused on implementation issues(Estevés and Pastor, 2001). Moller (2005) and Ifinedo & Nahar (2009) on the hand have argued that existing ES research overly emphasises on implementation issues and does not address post implementation issues. ES implementation projects are managed differently and in varying contexts (Hong and Kim, 2002) leading to different outcomes, leading to an important need to understand what makes some ES implementations more successful than others (Seddon et al., 2010). The following sections of this paper include a review of literature, discussion on contingent factors on ES benefits outcome and the proposal of a conceptual framework for ES benefit evaluation.

## LITERATURE REVIEW

Given the pervasive use of ES in today's organisational context, IT managers have perceived ES systems as one of their organisational most strategic computing platform (Hong and Kim, 2002) and investment (Davenport, 2000). The most compelling reason for ES adoption is driven by the promise of benefits which may be tangible or intangible in nature (Murphy and Simon, 2002) and can be achieved in the short-term or long-term (Seddon et al., 2010). According to Murphy & Simon (2002), tangible benefits tend to be operational and financial and more quantitative in nature whereas intangible benefits tend to be strategic and less quantitative in nature. Organisational benefits achieved from ES can be classified as operational, managerial strategic and technological improvements (Shang and Seddon, 2000).

Benefits anticipated from ES are drivers for investments in ES, however, researchers (Hsu and Chen, 2004) emphasise that planned or anticipated benefits from ES are often not realised. Levenburg and Magal (2004) suggest that although organisations realise ES benefits, these are not always the same as those that motivated organisations to implement the system. Despite the importance of ES, ES implementation failures are well-documented and it has been reported that three-quarters of ES implementations are considered as failure cases (Hong and Kim, 2002).

### ES Benefits Evaluation

Since ES is a large IT system (Sun et al., 2009), evaluation of ES benefits are easily underpinned by IT evaluation theory, suggesting that organisations invest in IT to achieve strategic and competitive advantage (Anandarajan and Wen, 1999). However, Alshawi et al. (2003) are of the opinion that benefits achieved from IT investments are generally less than expected. This is supported by Brynjolfsson and Hitt (1998) who discussed the IT productivity paradox based on IT investments.

Alshawi et al. (2003) further explains post ES implementation as outcomes and benefits, where an outcome is the result of introducing a new IT system, and a benefit is what is subsequently derived if the new capability is exploited. This distinction is crucial as organizations tend to first manage outcomes rather than benefits (Alshawi et al., 2003). The evaluation process is also considered in terms of micro and macro level benefits to establish the outcomes of ES implementations (Lesjak and Vehovar, 2005). Although IT/IS evaluation research (Ahituv, 1980; Ballantine and Stray, 1999; Remenyi and Sherwood-Smith, 1999; Stockdale and Standing, 2006; Seddon et al., 2010) to date is vast, Remenyi and Sherwood-Smith (1999) found that IT/IS evaluation particularly post implementation are required for project closure rather than project improvements. A review of the current literature shows a diversity of approaches and theories that suggests that IT/IS evaluation for ES benefits remains fragmented, presented in Table 1:

Table 1. Existing literature on ES benefits evaluation

Evaluation Focus	Publications
Performance-based: emphasis on financial, operational, accounting, or balanced scorecard metrics	Rosemann and Wiese (1999); Poston and Grabski (2000); Edwards (2001); Murphy and Simon (2001); Murphy and Simon (2002); Hunton et al. (2003); Chand et al. (2005); Cotteleer (2006); Cotteleer and Bendoly (2006); Wieder et al. (2006); Hendricks et al. (2007)
Theoretical-based: use of theories or conceptual models to assist in the evaluation of ES benefits	Kennerley and Neely (2001); Stefanou (2001); Beretta (2002); Legare (2002); Beard and Sumner (2004); Hedman and Borell (2004); Hsu and Chen (2004); Bendoly and Schoenherr (2005)
Interpretative-based: use of case studies or interviews to evaluate ES benefits	Markus et al. (2000b); Shang and Seddon (2000); Themistocleous and Irani (2001); Shang and Seddon (2002); Ash and Burn (2003); Hawking et al. (2004); Themistocleous (2004); Themistocleous and Chen (2004); Gefen and Ragowsky (2005); Holsapple and Sena (2005); Spathis and Ananiadis (2005); Ifinedo (2007); Ifinedo and Nahar (2009)

Literature highlighted in table 1 shows that traditional evaluation approaches tended to focus on technical questions, and attempt to evaluate ES benefits from a financial or operational performance basis. Existing studies largely ignore the implication of the tangibility of ES benefits, and the temporal variations, and the social implications of the ES implementations have on the outcomes of ES benefits. However, Hirschheim & Smithson (1987) have argued that for IT/IS evaluation to be meaningful, the inclusion of social and technical aspects are essential. Social aspect tend to be subjective in nature and difficult to analyse (Hirschheim and Smithson, 1987). Ballantine et al. (2000) note that recent IT/IS evaluation approaches have been shifting towards the social aspects and incorporating more subjective qualitative.

Although the methods of ES evaluation listed in Table 1 are equally valid, (Al-Mashari et al., 2003) propose that evaluation should consider the whole organisation, capture tangible and intangible aspects and also include soft

and hard elements such as IT flexibility, empowerment of users (Shang and Seddon, 2002) and other synergies achieved from integration of processes (Hsu and Chen, 2004). Another issue with evaluation of IT/IS benefits lies with quantifying and identification of relevant benefits and costs (Ballantine and Stray, 1999). Serafeimidis and Smithson (2000) also point out that there was a gap in theoretical work on IS evaluation and the practices found within the case study organisations found in literature.

Shang and Seddon (2002) argue that current literature on ES benefits evaluation tend to be high level analysis and do not take into account long-term benefits. Equally important, technical IS evaluation approaches often leads to meaningless conclusion that neglect the social activity inherent in the evaluation process as well as the political-social environment of an organisation (Hirschheim and Smithson, 1987). The nature of benefits tend to be intangible and qualitative (Symons, 1991; Murphy and Simon, 2002) and evaluation of benefits should not be constrained by quantification of costs and benefits (Symons, 1991).

Information system environment are constantly evolving (Heo and Han, 2003) for which it is important to have appropriate measures in place to take into account of this evolving nature of the environment. Heo and Han (2003) therefore suggested the need to use contingency approaches to evaluate the information performance due to the evolving relationship of information systems and their environments. This view is supported by Brown and Vassey (1999) who highlighted the need to identify contingency variables in ES implementations. Teo and King (1997) echoed similar views with the use of a contingent approach for information system and business planning based on the evolving nature of the organisation and information technology. Brown and Vassey (1999) also stated there are no systematic investigation in the contingency variables in ES implementations

### **A Contingent Approach to ES Benefits Evaluation**

The Contingency Theory (Fiedler, 1958) argues that there is no one best way of achieving organisational effectiveness, depending on the situation and variables considered.. Contingency Theory assumptions address issues of: 1) Fit – the better the fit between the variables, the better the performance of the organisation; 2) Performance – performance may not be always measured; 3) Rational actors – theory assumes that organisational actors always perform in accordance with the goal of organisational effectiveness; 4) Equilibrium – equilibrium is achieved when organisation is fit and performance is a result of that equilibrium; 5) Deterministic– causality interference is often made even though the methodologies used generally do not draw conclusions about causality (Weill and Olson, 1989).

Literature on ES discussed above suggest that not all organisations successfully obtain the benefits of ES even though it has been implemented (Hawking et al., 2004). Limited attempts in existing literature (Hong and Kim, 2002; Davenport et al., 2004; Møller, 2005; Seddon et al., 2010) have been made to investigate the various contingency factors that may have an impact on ES benefits realisation. More recently, Seddon et al. (2010) highlight the importance of understanding key factors in relation to organisational benefits by the use of two models to investigate short-term and long-term benefits emphasising on i) integration; ii) process optimisation; iii) improved access to information; and iv) on-going business improvements to be key factors that will influence long-term organisational benefits.

The information systems environment is constantly evolving with changes in the organisation as well as technological changes (Heo and Han, 2003). The context of evaluation therefore should include external and internal factors that influence evaluation and management (Serafeimidis and Smithson, 2000). Serafeimidis and Smithson (2000) propose that purpose, role, objectives as well as evaluation criteria should be defined although this may change due to constant interaction of the evaluation within its context. ES are dependent on maturity (Holland and Light, 2001); promotes tremendous organisational learning (Brynjolfsson and Hitt, 1998), and organisational innovation (Akhgar et al., 2002; Bendoly and Schoenherr, 2005).

### **A Process of Mutual Adaptation and Continuous Improvements via Organisation Learning and Innovation**

Organisational learning and innovation are highlighted by Shang and Seddon (2000) as benefits derived from the implementation of ES, however, Teo et al. (2010) suggest that organisational learning and innovation should be included as key factors that will influence ES benefits. Markus et al. (2000a) suggest that understanding how organisations adapt, use, maintain and upgrade the system are as important as understanding what benefits are derived. The transfer of knowledge will enable organisation to improve their capabilities by the innovating business processes (Ko et al., 2005). However, given that the implementation of a technological platform such as an ES is a dynamic and mutual change process between technology and organisation (Marabelli and Newell, 2009), the adaptation of technology and organisation will introduce new contingent variables that will also have an impact on the benefits realised.

Organisational learning is crucial to the successful assimilation of complex new technologies (Fichman and Kemerer, 1997). Brynjolfsson and Hitt (1998) claim that if there “lag and learning” effect prevails, there will be a delay in IT implementations to deliver the full benefits. Researchers (Wang et al., 2007; Marabelli and Newell, 2009) attempted to explain the lag by suggesting that different organisation possess different levels of capabilities to absorb and assimilate knowledge of ES implementations and to use ES effectively. Initial benefits achieved from ES are mostly inherent to the implementation process e.g. elimination of redundancy or unnecessary processes, improved resource allocations and standardisation of systems (Bendoly and Schoenherr, 2005). However it has been also suggested by Bendoly and Schoenherr (2005) that considerable benefits may be achieved by the adopting organisation pending on the strategy and utilisation. Interdependencies between organisational subunits created by ES capabilities of integrated processes contribute to benefits achieved through better coordination and information flows (Gattiker and Goodhue, 2005).

Shang and Seddon (2007) argue that benefits achieved from ES implementations can be effectively evaluated when the adopting organisation fully integrates ES into business operations allowing organisational learning to take place. Other researchers (Brynjolfsson and Hitt, 2000) also suggest that the process of organisational learning is critical to allow organisations to achieve benefits from IT. The flow of information exchange stimulating knowledge transfer and learning will provide adopting organisations opportunities to build up their internal knowledge leading to innovation (Sedera, 2007) and competitive advantage (Wang et al., 2007).

Organisational creativity or innovation can be defined as the creation of a useful new product, service, process through the cooperation of individuals in complex social system (Legare, 2002). Kumar et al. (2003) argue that IT systems are not an innovation and organisations will not be able to achieve sustainable competitive advantages because IT systems have become commodities that are easily available to competitors (Powell and Dent-Micallef, 1997). The organisational innovation process is not limited to the use of the system, development of complimentary business and human resources but also involves the extraction of competitive advantage from the IT system (Powell and Dent-Micallef, 1997; Kumar et al., 2003). ES implementations are complex technological projects that involve great degree of organisational change and innovation (Markus et al., 2000a).

Despite researchers naming the phase which organisational learning happen differently - “on and upward” phase (Markus et al., 2000b) or the third stage of evolution of ES implementations (Holland and Light, 2001), it is clear that there is a high penetration of ES usage during this period that provides strategic benefits. Deloitte’s (1999) study highlights that ES implementation is a continuous improvement process as organisations constantly attempt to achieve value from the ES which can be defined into three key stages: i) stabilisation phase; ii) synthesis phase; iii) synergise phase. Davenport (2004) gave his own interpretation of the continuous process that consists of integration, optimisation and information phases. The similarities of both views were highlighted as follow:

Table 2. Comparison of the phases of ES implementations (Deloitte, 1999; Davenport et al., 2004)

Phase	Deloitte (1999)	Davenport (2004)
1	<ul style="list-style-type: none"> <li>Stabilisation – Gaining familiarity with ES implementation use and organisational changes</li> </ul>	<ul style="list-style-type: none"> <li>Integration – Unifying database and processes with organisation environment and providing communication between functional units, process and stakeholders</li> </ul>
2	<ul style="list-style-type: none"> <li>Synthesis – Improving business through streamlining of processes, complimentary solutions and motivation of workforce</li> </ul>	<ul style="list-style-type: none"> <li>Optimisation – standardising processes, reengineering business processes and incorporating best practices embedded in ES</li> </ul>
3	<ul style="list-style-type: none"> <li>Synergise – Optimising of business processes</li> </ul>	<ul style="list-style-type: none"> <li>Information – Interpreting ES data into useful and relevant information and knowledge to support decision making and business analysis</li> </ul>

In an earlier study by the authors (Teo et al., 2010), it was argued that the synergise (Deloitte, 1999) and optimisation (Davenport et al., 2004) phases are similar. The process of implementing and use ES provides adopting organisations opportunities to gain information and knowledge from other sources to develop learning and cognitive abilities to allow employees from different functions to implement new processes to increase the organisation’s capabilities for learning and innovation. Our earlier study also provided limited evidence that suggest organisational learning and organisation innovation have assisted adopting organisations to further enhance the number of benefits that were obtained from their ES use. Some of the ES benefits (see Table 3) that were obtained due to organisational learning and organisational innovation were not initially anticipated as part of the initial implementation planning.

Table 3. The impact of contingency factors on benefits realisation (Teo et al., 2010)

Contingency Factor	Benefits Achieved
Organisational learning	i) improving individual performance, ii) improving productivity; iii) improving decision making; iv) reducing operation costs from shared services; and v) improved ES project management.
Organisational Innovation	i) improved customer relations management (CRM) and supply chain management (SCM); ii) improved business processes and iii) external linkages as well as IT flexibility.

Based on the findings, it was also understood that ES benefits achieved from the ES implementation is not limited to short-term but also include long-term benefits that are influenced by the organisational learning and organisational innovation. Hence it is essential that the evaluation of ES benefits take into consideration the nature of ES implementation and usage that are subjected to contingent factors such as organisational learning etc.

### CONCEPTUAL FRAMEWORK FOR ES EVALUATION

The proposed framework (Figure 1) is developed based on an earlier study on IS evaluation (Teo et al., 2010) and adapting organisational benefits from enterprise systems model (OBES) (Seddon et al., (2010), taking into account factors that Seddon et al argue impact benefits of ES. These factors include integration, process optimisation; improved access to information and on-going major ES business improvements. Our earlier study (Teo et al., 2010) indicate that organisational learning and organisational innovation have a positive impact on long-term of benefits such as improved productivity, better ES project management and external linkages. Other findings of this study suggest that most of the benefits derived from integration, process optimisation and improved access to information are obtained from organisational learning and on-going major business improvements are a result of organisational innovation.

The literature review has identified that current ES benefit evaluation research is fragmented with different approaches and paradigms. Dominant evaluation studies utilise financial or operational performance indicators to measure ES benefits. However, the review has also indicated that ES benefits vary in nature: short-term, long-term, tangible and intangible. Short-term benefits tend to be inherent to the ES implementation whereas long-term benefits tend to be influenced by temporal variations and usage of the ES i.e. IT maturity and other factors such as organisational change, organisational learning and organisational innovation. Contemporary literature has suggested that ES implementations and outcomes evolve over time (Ram and Swatman, 2008) and are influenced by inherent factors such as change management, education, processes and innovation (Staehr et al., 2012). Therefore it is necessary to adopt a dynamic and contingent way to understand and evaluate ES benefits.

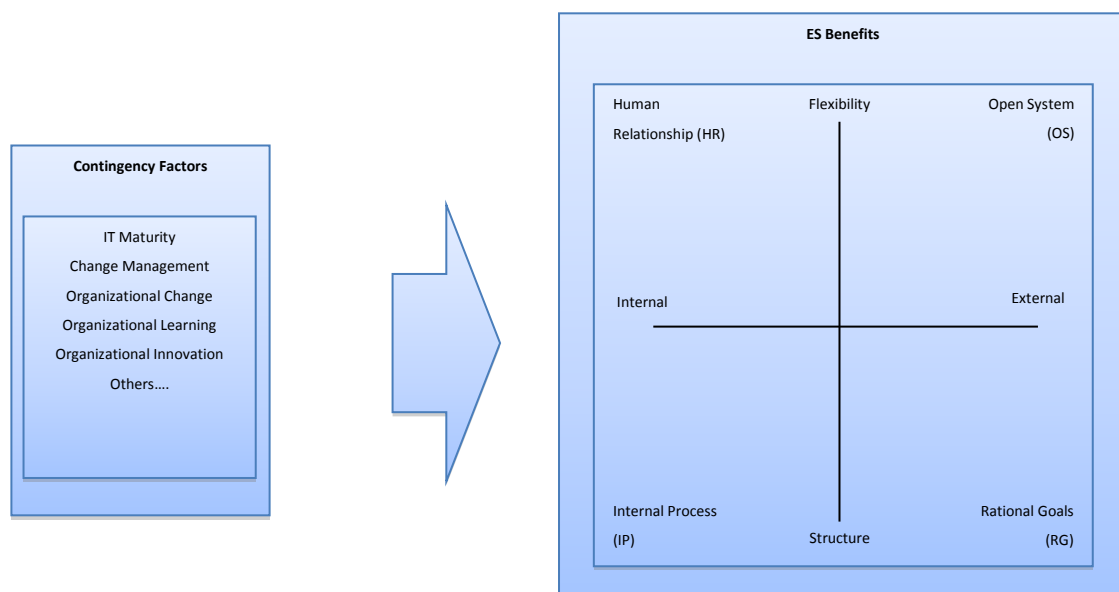


Figure 1. A Contingent Model for Evaluating ES benefits

The authors have considered the recommendations of Kohli and Devaraj (2003) who emphasise that IT evaluations need to address the issues of what is measured; how is it measured and; where is it measured. In “what is measure”, past studies have shown that the data source and analysis approach have an impact on the evaluation results. Study characteristics, such as the duration data collection describe how the data were gathered and such characteristics determine the sample size or data points in the study. On the issue of “where is measured”, prior studies (Kohli and Devaraj, 2003) have demonstrated that evaluation is more difficult in some industries compared to others. Studies that utilised organisations as the data sources have a higher chance of showing a positive relationship due to the completeness and availability of the data (Kohli and Devaraj, 2003).

To address the key issues of what and how ES benefits can be measured (Kohli and Devaraj, 2003) part of the conceptual framework comprise of the theory of competing value (CVA) as suggested by Quinn & Rohrbaugh Quinn and Rohrbaugh (1983) entails four components: 1) Human relationship or human resource development. People are considered participating members with a common stake in the social system; 2) Internal process that are outcomes of information management that brings about stability and control; 3) Open system including flexibility, readiness, growth, new opportunities and external support and brings about innovation and creativity; 4) Rational goals that is increased productivity and efficiency (Quinn & Rohrbaugh, 1983).

Hedmen (2000) extended the CVF to ES from the organisational perspective explaining that the four parts of an organisation that can be impacted by ES are human resource, open systems of collaboration and networking with external partners, improved internal processes and rational goals of better planning and management. These have been elaborated with literature evidences in the following section:

1. Human Resource (HR) is the first subtype and assists an organisation in the area of human-capital development. HR capabilities and features of relevance to this area are E-mail, voice mail and videoconferencing. These are associated with internal (Murphy and Simon, 2002) or/and organisational ES benefits (Shang and Seddon, 2000) that include: i) enable communication and collaboration amongst employees; ii) enabling management to empower; iii) monitoring and motivation employees (Sia et al., 2002).
2. Open System (OS) is the second subtype that possesses an external focus and an emphasis on structural flexibility. These ES features support environmental scanning, and issues of tracking and probing for market opportunities and entrepreneurship that are primarily associated with ES benefits of external (Lee et al., 2003) or/and strategic in nature (Shang and Seddon, 2000; Chand et al., 2005) and may include collaborative or external linkages to partners (Ash and Burn, 2003; Davenport and Brooks, 2004; Búrca et al., 2005).
3. Internal Processing (IP) is the third subtype that focuses on internal controls and stable structure emphasis. It supports the internal process model and the associated organisational roles. Its primary objectives are to provide support for auditing and controlling. Internal ES benefits that are of operational or/and tactical characteristics tend to be in this quadrant. This relates to the integration (Davenport, 1998) and centralisation (Markus et al., 2000b; Benders et al., 2006) brought about by the ES implementation and use that may also lead to shared services (Davenport, 1998; Markus et al., 2000b; Scapens and Jazayeri, 2003)
4. Rational Goals (RG) is the last subtype that has an external focus and stability in structure is a prerequisite. This subtype assist managers by providing means for production planning sales and logistics that are often outcomes of better IT infrastructural (Ross and Vitale, 2000; Gefen, 2004) and managerial (Shang and Seddon, 2002; Holsapple and Sena, 2005) benefits.

Hedmen’s (2000) use of CVF for ES evaluation has been adapted in combination with contingent factors analysed from a critical analysis of literature and an earlier study (Teo et al., 2010) to provides a comprehensive way of evaluating organisational effectiveness achieved from ES implementation.

## CONCLUSION

Based on the literature review discussed above, we discuss that extant literature shows that IT/IS evaluation research is divided among researchers despite numerous attempts to be holistic and bias free. Dominant economic or/and performance based approaches tend to ignore the social issues (Sarker and Lee, 2003) and intangible ES benefits. Theoretical/modelling based approaches, on the other hand, tend to neglect the organisational factors that have implications on the ES benefits realisation. This research argues that ES are complex in nature and have wide reaching organisational effects. This can considered true for the benefits that ES provides to the adopting organisation (Soh et al., 2000).

The embedded value of ES is derived from benefits that have been holistically evaluated with consideration for the following issues: i) some ES benefits are inherent to the system itself and come about when ES is implemented (Hayes et al., 2001) whereas other ES benefits have to reach a certain stage of maturity (influenced by organisational factors) to be attained before they can be fully evaluated (Deloitte, 1999; Hawking et al., 2004); ii) System maturity through learning and awareness (Brynjolfsson and Hitt, 2000; Brynjolfsson and Hitt, 2003) creates opportunities for further evolution of usage and benefits provide; and iii) theories and theoretical frameworks employed for evaluations need to be holistic in nature in order to effectively evaluate the system value (Levenburg and Magal, 2004; Uwizeyemungu and Raymond, 2010).

The conceptual framework shown in Figure 1 takes into consideration the contingent factors that will have an impact on ES benefits. The design of the framework suggests that benefits derived from ES will be impacted by factors such as IT maturity, organisational change, organisational learning and organisational innovation. The promotion of organisational learning and organisational innovation are two key factors that will assist organisations to exploit the potential of their ES implementation to achieve long-term benefits. Teo et al. (2010) suggest that different organisations have different levels maturity in the context of organisational learning and innovation, which complements Seddon et al. (2010) and Staehr et al. (2012), who suggest ES benefits are affected by different factors. This conceptual framework will be tested in a future study with the use of interpretive-based case studies in large Australian organisations. The conceptual framework provides ES managers and practitioners insights to ES benefits derived from their ES implementations that are affected by factors such as IT maturity, organisational change, organisational learning and organisational innovation.

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