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Integrating Sustainable Key Performance Indicators in Construction Company and Project Success

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Abstract

growth, which in turn has the potential to increase international rivalry with its own dynamics. The construction companies competing in international markets have to seek and implement the ways of gaining competitive advantage such as performance assessment in order to survive and improve success as well as coping with the rivals and sustaining the competition.
Nowadays, increasing awareness on sustainable development as well as environmentally friendly technological improvements and new management techniques force companies to transform their traditional ways of performance assessment considering the perspectives of sustainability such as "environmental", "economic", and "social" values. In pursuit of sustainability a company can have many advantages in national and international markets such as; declining costs and risks while increasing profitability, having clean technology, increasing reputation and growth rate of the company, coping with recent changes in technology and the ability to serve with latest techniques.
In this respect, in the field of performance evaluation Sustainable Key Performance Indicators (SKPIs) dealing with "economic, social and environmental" values should be added in addition to Key Performance Indicators (KPIs) which only measure time and production costs.
In this research, the effects of KPIs and SKPIs on success will be investigated separately and the comparison of SKPIs with the existing traditional KPIs will be established. Also it is aimed to determine social and environmental proceeds of SKPIs, in addition to the proceeds of KPIs such as increasing the company's and industry's success with their contributions to the country's economy.

Keywords: Sustainability, Key Performance Indicators, Performance Management

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Introduction

In recent years, globalized markets, improved technology, increased competition and as a result, transformed demands and needs of customers force construction companies to leave traditional management techniques and seek alternative ones. Construction industry is in need of transforming their traditional ways of benchmarking and management systems because of recent technologic improvements, and new management techniques. Of course these transformations must be done by considering sustainable indicators such as environmental, economic, and social values. A company that pursues sustainability with paying attention to environmental, economic and social values can have many advantages in national and international markets. Some of these advantages are; declining costs and risks while increasing profitability, having clean technology, increasing reputation of the company, increasing growth rate of the company, coping with recent changes in technology and the ability to serve with latest techniques.

For this reason, in the field of performance evaluation in the construction sector Sustainable Key Performance Indicators (SKPI) should be added in addition to Key Performance Indicators which measure time and production costs.

Performance Measurement and KPIs in Construction

Competition is intense within the construction industry. Construction companies need to make effective project management and evaluate their performance score to survive in intense competition environment. In a time of globalization and an increasingly competitive environment, measuring performance has become critical to business success (Işık, 2009). The construction industry has been criticized for its underperformance and the Latham and Egan reports emphasized the need for performance improvement and measurement (Bassioni et al., 2005).

As construction firms realized, sustainable business success depends on the performance measurement. So, the importance of business performance measurement across industries has elevated in the last decade in what has been described as a revolution. Bititci et al. (1997) explain performance management as; *"... is seen as a closed loop control system which deploys policy and strategy, and obtains feedback from various levels in order to manage the performance of the system"* whereas the performance measurement system *"... is the information system which is at the heart of the performance management process and it is of critical importance to the effective and efficient functioning of the performance management system."*

Also, performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action. In terms of effectiveness, achieving a higher level of product reliability might lead to greater customer satisfaction. In terms of efficiency, it might reduce the costs incurred by the business (Neely et al., 1995). In this context, firms have to develop right

strategic planning and manage their resources better in order to provide the continuity of sustainable competition and sustain their assets in both short term and long term. According to this, performance measurement become an indispensable strategic tool to achieve success and continuous improvement (Işık et al., 2010) and used as a business tool for evaluating management performance, managing human resources, and formulating corporate strategy (Yu et al., 2007).

The one of the importance of identifying an organization's performance is also evident throughout the world-wide markets, the results of which are to attract future investment, increase share value and attract high caliber employees. Therefore, it is important to consider how an organization's performance is measured and how it can be communicated to the wider market; i.e. how can it be understood and interpreted by the potential investors, employees and customers (Kagioglou et al., 2001).

In addition, performance measurement is useful in benchmarking, or setting standards for comparison with best practices in other organizations, provides consistent basis for comparison during internal change efforts and indicates results during improvement efforts (Işık, 2009).

Another reason is why performance measurement important for construction firms; they can improve quality and success. Continuous performance measurement should be basic for the provision of feedback which is very critical for continuous improvement and realizing the product and the process of the construction in a successful and effective way in construction sector.

A lot of companies in the construction industry waste their resources in their projects (Nudurupati et al., 2007). Performance measurement which is a kind of learning loop of companies itself helps companies to decide on their objectives clearly, therefore optimizes operations in the company since objectives and results are more closely aligned. Because of this reason measuring performance shows effectiveness, efficiency and deficiency. Successful measurements of performance prevent repeated failure such as waste resources. Because of all these reasons by using performance measurement organizations can achieve their goals by satisfying their customers with greater energy efficiency and effectiveness than their competitors (Kotler, 1984).

In this context, importance of performance measurement for the construction firms can be summarized such as:

- Achieving a higher level of product reliability might lead to greater customer satisfaction (Neely et al., 1995),
- Used as a strategic tool to achieve success and continuous improvement (Işık et al. 2010),
- Evaluating management performance, managing human resources, and formulating corporate strategy (Yu et al., 2007),
- The results of which are to attract future investment, increase share value and attract high caliber employees (Kagioglou et al., 2001),
- Benchmarking or setting standards for comparison with best practices in other organizations (Işık, 2009),

- Improve quality and success,
- Shows effectiveness, efficiency and deficiency,
- Performance measurement, determines how successful firms are in achieving their goals in line with their own strategies (Kagioglou et al., 2001),
- Learning loop of companies itself,
- Preventing the repeated failure such as waste resources,
- Provides customer satisfaction while reducing the costs incurred by the business,
- Optimizes operations in the company since objectives and results are more closely aligned,
- Through the agreed objectives program managers and staff can make planning and manage resources to achieve desired outcomes (Performans Ölçüm Rehberi, 2000),
- Provides feedback that is so critical to future success and continuous improvement (Performans Ölçüm Rehberi, 2000).

Effects of Sustainable Construction on Company and Project Performance

During past years the concepts of sustainability, efficiency and green building gained greater emphasis in construction industry as international concern over global warming and climate change have grown in volume.

After the recognition that the construction industry has the largest share on ecological damage with the energy use, fossil fuels and produced wastes during the life cycle; measuring the environmental impact of buildings, evaluation within certain criteria and certification of buildings that provide healthy, comfortable and natural life cycle become widespread.

Considering the fact that structures having responsibility in a large share in the consumption of natural assets (Kincay, 2012); the concept of "environmentally friendly structures", "green buildings" and "sustainable construction" within construction companies is spreading rapidly.

The increasing awareness and significance of sustainable building accelerates the transition to sustainable construction and forces companies to transform their traditional ways of construction processes considering the perspectives of sustainability.

Sustainable construction is seen as a way for the construction industry to respond to achieve sustainable development (Bourdeau, 1999). Sustainable construction is also seen as a new way for the building industry to respond towards achieving sustainable development on the various environmental, social, economic and cultural facets (CIB 1998). Brundtland Report - Our Common Future Report, defined sustainable development as: *"…to provide the needs of today's generation without taking away the rights of future generations"* (Our Common Future, Brundtland Report, 1987). Because of this reason sustainable construction is so important for construction firms that will implement these construction techniques. With the implementation of sustainable construction, the construction industry is bound to bring about

positive changes; i.e. less pollution, waste and even constitutes to the well-being of future generations.

As green development emerged as unavoidable for sustainable growth, acquaintance of the construction industry with green technologies increased. This attention about sustainability will have some economical impacts such as providing employment, supporting local economy with activating sub-industries of the green buildings.

Because of this reason, some countries such as US even see green buildings as a way out of the economic crisis (Yeşil Bina Ağaoğlu, 2012).

Sustainable construction has a number of potential benefits. The major economic benefits of sustainable construction are an improvement of building performance and durability due to a reduce from the maintenance and operation costs during building's life and thought the provision of an ideal living and working place leading to increase on productivity. However, the misconception of an increase capital cost and lack of a visible market value discourages both developers and contractors (Zhou and Lowe, 2003).

Sustainable construction also has a potential benefit, not only the short term cost reduction, but also in terms of whole life cost savings. Further, it reduces natural and human resource costs; this is beyond the traditional perception of sustainable construction. These benefits are critical and will bring a better value for the building itself, the developers and end users.

Also the implementation of a green agenda will provide benefits economically; for example, knowing a company's energy footprint can be vital to unlocking government sponsored tax credits and incentives for improvements that reduce the company's energy costs (Deloitte, 2012).

Heerwagen (2000) also highlighted that green building contribute positively to business performance and organizational effectiveness. First, green buildings are relevant to business interests across the full spectrum of concerns, from portfolio issues to enhanced quality of individual workspace. Second, the high performance of green buildings will influence of the outcomes of organizations such as workforce attraction, retention, quality life, work output, and customer relationships. Third, green building can provide cost reduction benefits and value added benefits.

The construction industry also plays a major role in improving the quality of the built environment, but it also impacts on the wider environment in a number of ways. Government, industry and firms all have a role to play in promoting environmental improvements and reducing the environmental impacts of the built environment, both in terms of construction and during the life of buildings (Construction Excellence, 2012).

Construction and building materials sectors are one of the top industries that have high influence on environmental pollution due to greenhouse gas emission of fuel and electricity consumption and waste material of production of construction materials and construction and destruction processes. Because building materials industry has high energy demands, it is one of the high-risk industries after Kyoto Protocol.

The fact that increasing rate of population growth, urbanization and industrialization increases the demand of energy directed countries to seek

alternative energy sources as well as find ways that using current sources more efficiently.

One of the most important requirements to ensure sustainable environment is to achieve sustainable energy using in buildings with advanced technology (Ozdemir, 2005). In this perspective the firms having opportunity to adopt energy and environmental awareness within the design and construction, approach to the issue of sustainability with social and environmental responsibility and awareness, will increase the quality of buildings and living areas by designing and building healthy environment. Therefore, construction companies started to use "energy efficient" and "environment friendly" concept in their new buildings. Construction materials industry have crucial role in increasing energy efficiency in buildings due to producing materials that can be used in energy efficiency. In this regard, green technology supports sustainable construction.

Many construction companies consider the issue of sustainability also as corporate social responsibility and by this way, the firm -while conducting its activities- act responsibly to the environment, society and people. In addition, the adoption of sustainability as corporate social responsibility will bring a competitive advantage over rivals. For example in Turkey, leading construction firms like TAV, Yüksel Construction published their corporate social reports; describing firms' general structures, financial performances, employment structures and knowledge about the recent social and environmental projects. Furthermore, reports contain firms' yearly sustainability targets (Yüksel Construction Yüksel's Sustainability Report, 2011; TAV's Sustainability Report, 2010).

Also, due to increasing interest in houses that is highly energy efficient, constructed with materials that minimal effect on environment and having some recycling features by consumers causes these areas becoming competitive among construction companies. Companies try to embed these energy efficiency and sustainability features into their construction processes so that they can create a value that can strengthen their competitive strategy.

Construction companies have turned to the issue of sustainability in order to maintain global competitiveness. Construction companies realized that they can increase their global competitiveness with environmentally friendly products and production, the use of renewable energy, photovoltaic products, innovative products according to local needs, greenhouse gas and carbon footprint reduction and life cycle of the material. Creating values such as safe future for environment, innovation, energy efficiency or sustainability causes construction firms distinguish in comparison to other companies that have similar products or services. By this differentiation strategy construction firms will have competitive edge.

There are economic, environmental and social proceeds of sustainable construction on the basis of three main titles of sustainability. To sum up the reasons of increasing importance of sustainability for the construction companies;

- Largest share on consumption of energy and natural assets
- Awareness about benefits of sustainable construction,

- Awareness about energy and environmental impacts of buildings,
- Stakeholder demands, shareholders expectations about "environmentally friendly structures", "green buildings" and "sustainable construction",
- Reputation of company,
- Competitive advantage,
- Enhancement of goodwill and brand image (Zhou and Lowe, 2003),
- Community, government, and regulatory support (Zhou and Lowe, 2003),
- Capital cost savings (Yates, 2001),
- Reduced running costs (Yates, 2001),
- Increased investment returns (Yates, 2001),
- Increased productivity, staff recruitment and retention (Yates, 2001),
- More efficient resource use (Yates, 2001),
- Major image/ marketing spin-offs (Yates, 2001),
- Advantages of reducing operating costs while increasing profitability by providing a huge amount of decrease in energy consumption, emission of carbon dioxide, water consumption and waste,
- Activating sub-industries of the green buildings such as solar panels, purification, usage of nontoxic and recyclable materials, heat and water insulation.

Sustainable Key Performance Indicators

Measuring performance for sustainability is an important issue as well as increasing awareness on sustainable development, environmentally friendly technological improvements and new management techniques. Because of these issues, companies transform their traditional ways of performance assessment, which only measure time and production costs, considering the perspectives of sustainability such as “environmental”, “economic”, “social” and “technical” values. Increasing competitiveness in construction industry, limited resources and globalization have created a need for sustainable criterions.

KPI’s which are the criteria of performance are investigated within this part of paper. Here upon, SKPI’s are determined as first step of future work. In this context, Table 1 focuses on the sustainable criterions, which are determined from literature review of KPI’s.

Table 1. Determined List of SKPI’s

ECONOMICAL SKPI’S
Cost: Fernández-Sánchez and Rodríguez-López, (2010); Wang and Huang, (2006); Lim and Mohamed, (1999); Almahmoud, E.S., et al. (2011); Lim and Mohamed, (1999); Cheung, Suen and Cheung , (2004); Crane, T.G., et al. (1999); C21 Construction Contract, (1999); Transport and the Regions (DERT), (2000); Veleva and Ellenbecker , (2001).

– **Life Cycle Cost:** Fernández-Sánchez and Rodríguez-López, (2010); Shen, L. et al., (2011).
– **Project Financing Channels:** Shen, L. et al., (2011).
– **Payback Period:** Shen, L. et al., (2011).
– **Interim Payment:** Cheung, Suen and Cheung, (2004).
– **Cost Claims:** Cheung, Suen and Cheung, (2004).
– **Final Account Forecast:** Cheung, Suen and Cheung, (2004).
Time: Westerveld (2003); Wang and Huang, (2006); Lim and Mohamed, (1999); Project Management Institute, (2004); Almahmoud, Doloi and Panuwatwanich, (2011); Lim and Mohamed, (1999); Cheung, S.O. et al. (2004); Crane, T.G., et al. (1999); C21 Construction Contract, (1999); Transport and the Regions (DERT), (2000).
– **Achievement of Critical Dates:** Cheung, S.O. et al. (2004).
Technical Requirements: Fernández-Sánchez and Rodríguez-López, (2010).
– **Constructibility:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Quality Control:** Fernández-Sánchez and Rodríguez-López, (2010); Westerveld , (2003); Wang and Huang, (2006); Lim and Mohamed, (1999); Project Management Institute, (2004); Almahmoud, Doloi and Panuwatwanich, (2011); Lim and Mohamed, (1999); Cheung, S.O. et al., (2004); Crane, T.G., et al., (1999); C21 Construction Contract, (1999); Transport and the Regions (DERT), (2000).
– **Design for Disassembly or Change of Use:** Fernández-Sánchez and Rodríguez-López, (2010); Cheung, S.O. et al. (2004); Transport and the Regions (DERT), (2000).
– **Quality Management Accreditation:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Synergies with Other Projects**: Fernández-Sánchez and Rodríguez-López, (2010).
Bureaucracy: Fernández-Sánchez and Rodríguez-López, (2010).
– **Types of Contracts:** Fernández-Sánchez and Rodríguez-López, (2010); Crane, Felder, Thompson, Thompson, and Sanders, (1999); C21 Construction Contract, (1999); Transport and the Regions (DERT). (2000).
– **Project Management**: CEEQUAL (2012), Fernández-Sánchez and Rodríguez-López, (2010).
– **Governance and Strategic Management of Projects:** Fernández-Sánchez and Rodríguez-López, (2010).
Management of Financial Risk : Keeble, Topio and Berkeley, (2003); Shen, Wu and Zhang, (2011); Kim, Han, Kim and Park (2009).
Innovation: Staniškis and Arbačiauskas, (2009); Keeble, Topio and Berkeley, (2003).
SOCIAL SKPI'S
Protection to Landscape, Historical Sites and Culture: Fernández-Sánchez and Rodríguez-López, (2010); Shen, Wu and Zhang, (2011); Keeble, Topio and Berkeley, (2003).
Participation of all Actors: Fernández-Sánchez and Rodríguez-López, (2010); Brent and Labuschagne, (2004); Labuschagne, Brent and Ron van Erck, (2004).
– **Engagement with Relevant Local Groups, Human Environment, Aesthetics and Employment:** CEEQUAL, (2012), PERSI Technical Committee, (2006), Veleva and Ellenbecker, (2001).

– **Stakeholders Satisfaction:** Yu, A.G et al., (2005), Wang and Huang, (2006), PMI, (2004).
Security: Fernández-Sánchez and Rodríguez-López, (2010); Labuschagne, C. et al., (2004).
– **User Security:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Security of the Infrastructures:** Fernández-Sánchez and Rodríguez-López, (2010).
Public Utility: Fernández-Sánchez and Rodríguez-López, (2010).
– **Client Acceptance:** Lim and Mohamed, (1999); Pinto and Slevin, (1987).
– **Satisfaction of Society:** Fernández-Sánchez and Rodríguez-López, (2010); Almahmoud, Doloi and Panuwatwanich, (2011); Cheung, Suen and Cheung, (2004); Transport and the Regions (DERT), (2000).
Responsibility: Fernández-Sánchez and Rodríguez-López, (2010).
– **Community Development and Social Justice:** Veleva and Ellenbecker , (2001).
Safety and Health of Workers: Keeble, Topio and Berkeley, (2003); Fernández-Sánchezand Rodríguez-López, (2010); Davidson and Wilson, (2006); Labuschagne, Brent and Ron van Erck, (2004); Lim and Mohamed, (1999); Almahmoud, Doloi and Panuwatwanich,(2011); Pinto and Slevin, (1987); Cheung, Suen and Cheung, (2004); Crane, Felder, Thompson, Thompson, and Sanders, (1999); C21 Construction Contract, (1999); Transport and the Regions (DERT), (2000).
– **Education, Training, and Campaigns (number of meeting, toolbox talks, introduction courses, workshops, people participating)**: Cheung, Suen and Cheung, (2004); Veleva and Ellenbecker, (2001).
– **Organizational Learning:** Veleva and Ellenbecker, (2001).
Social Infrastructure
– **Local Health & Safety & Security:** Keeble, Topio and Berkeley, (2003); Brent and Labuschagne, (2004); Labuschagne, Brent and Ron van Erck, (2004).
Employment
– **Employment stability:** Brent and Labuschagne, (2004); Labuschagne, et al., (2004).
Communication and Management (number of meetings held with contractors/consultants in the month, number of change orders approved by the client, number of day work orders issued, number of Requests For Information (RFIs) raised, number of letters/Engineer Reply Forms (ERFs) issued to contractor/consultant, number of letters/Contractor Submission Forms (CSFs) received from contractor/consultant): Lim and Mohamed, (1999); Pinto and Slevin, (1987); Cheung, Suen and Cheung, (2004); Crane, Felder, Thompson, Thompson, and Sanders, (1999); C21 Construction Contract, (1999).
Product features: Veleva and Ellenbecker, (2001).
Satisfaction
– **Stakeholder's Satisfaction:** Wang and Huang, (2006); Yu, Flett and Bowers, (2005); Cheung, Suen and Cheung, (2004).

– **Complaints and Prosecutions (number of complaints received from staff, average time taken to close out the complaint (days):** Cheung, Suen and Cheung, (2004); Veleva and Ellenbecker, (2001).
Macro Social Performance
– **Migration of Clients / Changes in Macro-social the Product Value Chain:** Brent and Labuschagne, (2004).
– **Comparisons Between Organizations' Performance:** Veleva ve Ellenbecker, (2001).
ENVIRONMENTAL SKPI'S
Soil: Cheung, Suen and Cheung, (2004), Crane, Felder, Thompson, Thompson, and Sanders, (1999); C21 Construction Contract, (1999).
– **Ecological Effect:** Shen, Wu and Zhang, (2011).
Water : Keeble, Topio and Berkeley, (2003); CEEQUAL; Fernández-Sánchez and Rodríguez-López, (2010); Davidson and Wilson, (2006); Brent and Labuschagne, (2004); Labuschagne, Brent and Ron van Erck, (2004); Da and Ruwanpura, (2009); PERSI Technical Committee, (2006).
– **Protection of Water Resources:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Water Pollution**: Brent and Labuschagne, (2004).
Atmosphere / Air: Keeble, Topio and Berkeley, (2003); Fernández-Sánchez and Rodríguez-López, (2010); Brent and Labuschagne, (2004); Labuschagne, Brent and Ron van Erck, (2004); Da and Ruwanpura, (2009); PERSI Technical Committee, (2006); Cheung, Suen and Cheung, (2004).
– **Carbon Emissions in Use:** CEEQUAL, (2012).
Landscape: CEEQUAL (2012); Fernández-Sánchez and Rodríguez-López, (2010); PERSI Technical Committee, (2006).
– **Landscape Issues in Design:** CEEQUAL; Da and Ruwanpura, (2009); PERSI Technical Committee, (2006).
Land Use : CEEQUAL (2012); Brent and Labuschagne, (2004); Labuschagne, Brent and Ron van Erck, (2004); PERSI Technical Committee, (2006).
– **Design for Minimum Land-Take:** CEEQUAL; PERSI Technical Committee, (2006).
– **Land Pollution:** Brent and Labuschagne, (2004); Shen, Wu and Zhang, (2011).
– **Development Density/Urban Development:** Da and Ruwanpura, (2009).
Resources: Fernández-Sánchez and Rodríguez-López, (2010).
– **Optimization of Resources:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Materials with CE:** Fernández-Sánchez and Rodríguez-López, (2010).
– **Resource Reuse:** Da and Ruwanpura, (2009).
– **Energy and Material Use (Resources):** Veleva and Ellenbecker, (2001).
– **Use of Regional Materials:** Fernández-Sánchez and Rodríguez-López, (2010).
Waste: Keeble, Topio and Berkeley, (2003); CEEQUAL; Davidson and Wilson, (2006); Cheung, Suen and Cheung, (2004).

– **Design for Waste Minimization:** CEEQUAL; PERSI Technical Committee, (2006).
– **On-Site Waste Management:** CEEQUAL; PERSI Technical Committee, (2006).
– **Recycled Waste:** Staniškis and Arbačiauskas, (2009).
– **Construction and demolition wastes are sorted:** Cheung, Suen and Cheung, (2004).
Energy: CEEQUAL; Davidson and Wilson, (2006); Labuschagne, Brent and Ron van Erck, (2004); Da and Ruwanpura, (2009); PERSI Technical Committee, (2006).
– **Savings and Energy Efficiency:** Shen, Wu and Zhang, (2011).
– **Life-Cycle Energy and Carbon Analysis:** CEEQUAL; PERSI Technical Committee, (2006).
– **Energy and Carbon Emissions In Use:** CEEQUAL; PERSI Technical Committee, (2006).
– **Green Power:** Da and Ruwanpura, (2009).
Material Use: CEEQUAL; Davidson and Wilson, (2006); Da and Ruwanpura, (2009); PERSI Technical Committee, (2006); Cheung, Suen and Cheung, (2004).
– **Environmental Impact of Materials Used:** CEEQUAL; PERSI Technical Committee, (2006)
– **The Right Amount of Raw Materials are Ordered:** Cheung, Suen and Cheung, (2004).
– **Local/Regional Materials:** Da and Ruwanpura, (2009).
Indoor Environmental Quality: Da and Ruwanpura, (2009).
– **Low-emitting Materials:** Da and Ruwanpura, (2009).
– **Indoor Chemical and Pollutant Source Control:** Da and Ruwanpura, (2009).
– **Daylight and Views:** Da and Ruwanpura, (2009).
– **Chemical Use:** Veleva and Ellenbecker, (2001).
Project Environmental Management: PERSI Technical Committee, (2006).
Legal
– **Health, Safety, Environment and Statutory Requirements:** Jaafari, (2009); Almahmoud, Doloi and Panuwatwanich, (2011).
TECHNICAL SKPI'S
– **Ability and Capacity**
– **Attitude and Ability of Owner and A/E:** Kim, Han and Kim, (2009).
– **Contractor's Capability and Experience:** Kim, Han and Kim, (2009).
– **Design Engineering Ability:** Kim, Han and Kim, (2009).
Conflict
– **Capability of Claim and Dispute Resolution:** Kim, Han and Kim, (2009); Cheung, Suen and Cheung, (2004); Crane, Felder, Thompson, Thompson and Sanders, (1999).
Management

– **Organizational Success:** Wang, Huang, (2006); Shenhar, Dvir, Levy and Maltz, (2011).
– **Scheduling and Time Management:** Jaafari, (2009); Almahmoud, Doloi and Panuwatwanich, (2011).
– **Performance Assessment:** Jaafari, (2009); Almahmoud, Doloi and Panuwatwanich, (2011); Lim and Mohamed (1999); Cheung, Suen and Cheung, (2004); Transport and Regions (DERT), (2000).
– **Corporate Understanding of Project Management:** Lim and Mohamed, (1999); Kerzner, (1987).
– **Organizational Adaptability:** Lim and Mohamed, (1999); Kerzner, (1987).
– **Project Manager Selection Criteria:** Lim and Mohamed, (1999); Kerzner, (1987).
– **Top Management:** Lim and Mohamed, (1999); Pinto and Slevin, (1987).
Application
– **Implementation Master Plan:** Jaafari, (2009); Almahmoud, Doloi and Panuwatwanich, (2011).
Quality
– **Survey (Samples) Rejection (due to lateness and workmanship):** Cheung, Suen and Cheung, (2004).
– **Number of Site Inspections Conducted:** Cheung, Suen and Cheung, (2004).

Conclusion

In a competitive world, construction firms should evaluate their project success and their own company success regarding to the sustainable criterions such as “environmental”, “economic”, “social” and “technical” values instead of their traditional ways of performance assessment, which only measure time and production costs.

Measuring performance provides increasing awareness on sustainable development as well as environmentally friendly technological improvements and new management techniques. In this context, declining costs and risks while increasing profitability, having clean technology, increasing reputation of the company, increasing growth rate of the company, coping with recent changes in technology and the ability to serve with latest techniques are being related with sustainable development and performance through performance measurement.

Sustainable construction’s importance and performance measurement’s importance for construction firms which wants to survive in competitive world were researched with the scope of this work.

Finally, the preliminary work of determining SKPI’s which were given previous parts was added in addition to KPI’s which only measure time and production costs.

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