

Replacement of the existing Merensky Reef operations at Lebowa Platinum Mines: an integrated business and operational readiness approach

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Lebowa Platinum Mines has been in operation since the late 1960s and is a relatively small producer compared to Anglo Platinum's other operations. The mine has never had substantial capital investment to expand its production scale even though its resource base is estimated in excess of 100 years at current mining rates. It is forecast that the mine will become unprofitable after 2008 due to the workings of the ageing infrastructure, the Merensky Reef operations being further from the shafts, decrease in productivity and increase in operating costs.

In order to reverse the forecast decline in operational inefficiencies and profitability the replacement of the Merensky Reef operations at Vertical and UM2 shafts with the development of a 120 Ktpm Brakfontein Merensky Reef Mines is in progress.

This paper covers the operational readiness framework developed from the control budget estimate and outlines an integrated business process adopted to ensure that the requirements of the investment proposal are met.

The operational readiness framework, which addresses the transition process, will ensure that at operational start-up, all appropriate operating systems, procedures, information and legal requirements are in place, whereas the business integration process will aim to develop and sustain an organization with the appropriate infrastructure and workforce equipped with the necessary skills to meet Brakfontein's requirement, and where possible embark on an optimized accelerated production initiative to ensure that the objectives of the investment proposal are sustained.

Keywords: operational readiness, business integration, optimized accelerated production initiative, organizational development.

Background

Lebowa Platinum Mines (LPM) is 100% owned by Anglo Platinum (AP) and is located in the northern sector of the eastern limb of the Bushveld Complex, between Polokwane and Steelpoort (Figure 1). The mine has been in operation since the late 1960s and is a relatively small producer compared to Anglo Platinum's other operations with annual refined output of some 75 000 oz from the Merensky Reef (MR) and 30 000 oz from the UG2 reef (UG2). The mine has never had substantial capital investment to expand its production scale even though its resource base is estimated in excess of 100 years at current mining rates.

It is forecast that the current MR operations will become unprofitable within five years due to the ageing infrastructure and distance of the workings from the shaft, resulting in decreases in productivity and increases in operating costs.

In order to reverse the forecast decline in operational inefficiencies and profitability, replacement of the MR operations at Vertical and UM2 shafts with the development of a 120 ktpm Brakfontein mine is in progress.

The 1641 in-service staff required to produce 120 ktpm at Brakfontein will be deployed from the existing MR operations.

Mine design

The mine footprint (Figure 2) will be accessed from surface via a twin decline system (conveyor and material) and a chairlift decline for personnel transport. A vertical upcast shaft and two vertical downcast shafts will be sunk as part of the ventilation reticulation system.

The mining method is conventional breast stoping with back lengths of up to 250 m. Trackless footwall drives will be developed and equipped with conveyors for rock transport. The capital footprint will require the development of three production levels that will open up sufficient stoppable face length as part of the build-up to full production.

Initial work on the Brakfontein project commenced in August 2004 and is scheduled to be completed in 2010, with full production attained the same year and the life of mine (LOM) extending to 2021 to 650 m depth. Figures 3 and 4 show the ore production profiles from 2004 to 2021 respectively.

Business integration and operational readiness

To ensure that the ramp-up to steady operation is achieved (producing 120 ktpm of ore safely at the targeted operating cost), an integrated business and operational readiness (OR)

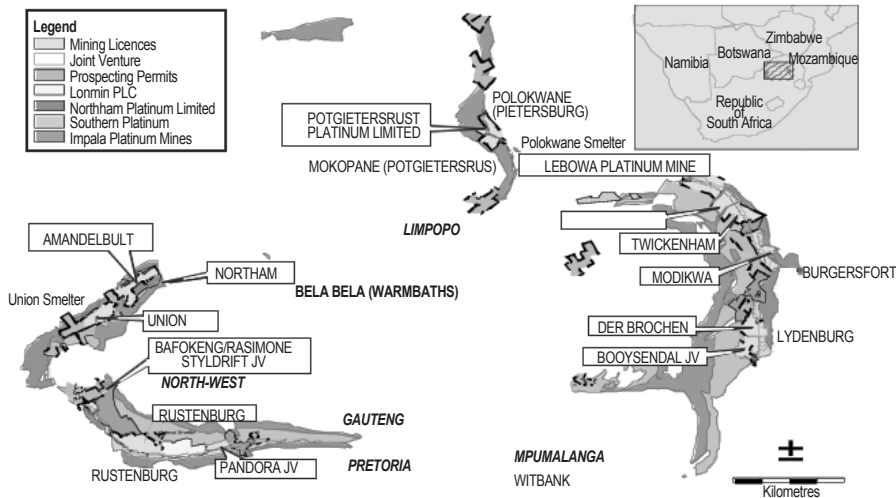


Figure 1. Locality map of Lebowa Platinum Mines

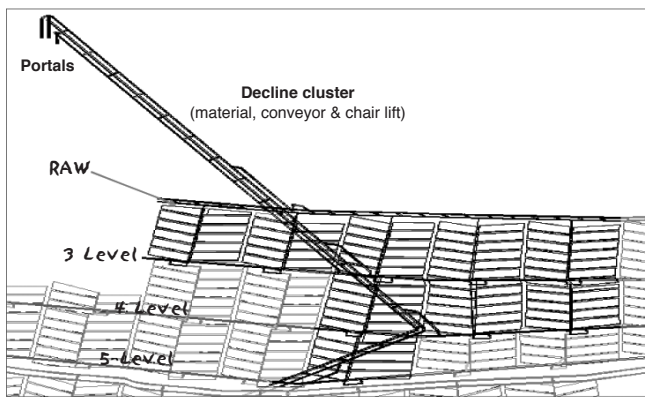


Figure 2. Brakfontein MR project footprint

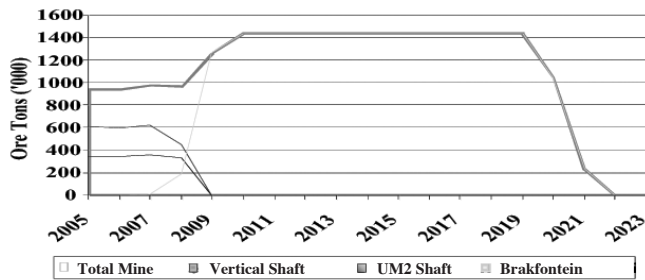


Figure 3. LOM production profile

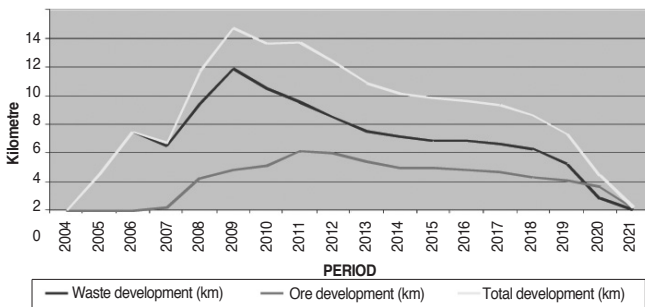


Figure 4. LOM development profile

process has been put in place. This process is not seen as a commissioning phase activity but has been planned, budgeted and scheduled like any other phase of the project life cycle.

Business integration

Implementation of the Brakfontein project will be managed by the stepped integrated business approach detailed in Figure 5. These key performance indicators (KPIs) will form the basis of the monthly OR report.

Operational readiness

The OR strategy seeks to ensure that the organizational structures, personnel, leadership and the operating environment are capable of sustaining the overall business strategy through operational influence and support on design, technical, transformation leadership and project management. By so doing, issues on operational strategy, leadership, assurance and stakeholder management will be addressed and benchmarked against industry best practice.

A framework developed to ensure that the requirements of the investment proposal are met is illustrated in the Figure 6.

Value chain

The project strategy seeks to implement and deliver the commitments in the feasibility study and investment proposal through validation of detailed engineering design, procurement and construction. These are addressed through project and business integration, leadership, project governance and project stakeholder management. The transition between the project and operational phases is managed by the value chain illustrated in Figure 7.

Organizational development

Brakfontein is embarked on becoming a flagship mine in the eastern limb by virtue of the quality of the mining operations carried out by the mining contractor, Capital Development Services (CDS), and the efficient manner in which capital expenditure and project delivery is being managed. Currently the project is four months ahead of the feasibility study programme. It is the intention of both the project team and LPM staff to ensure that the key performance indicators stated in the feasibility study are achieved or bettered once the project is handed over to operations.

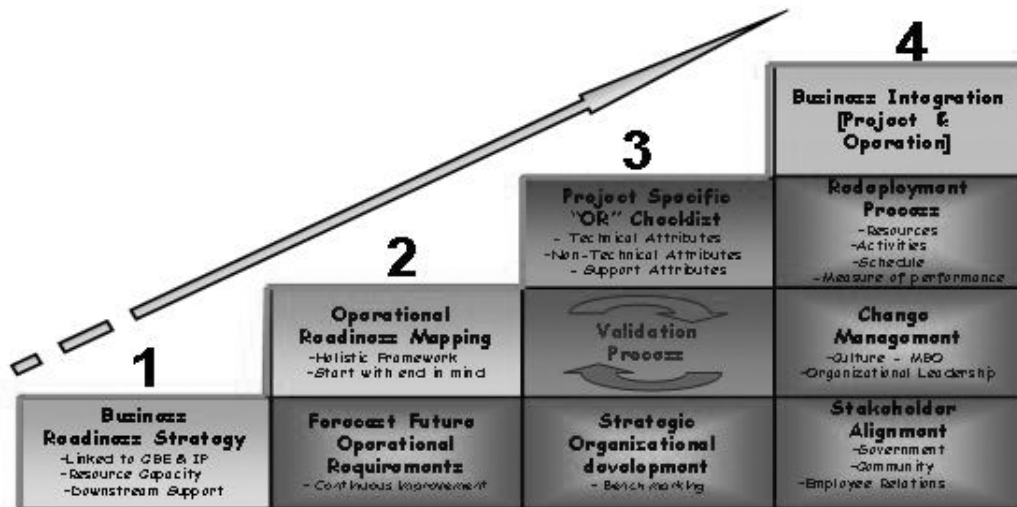


Figure 5. Stepped business integration approach

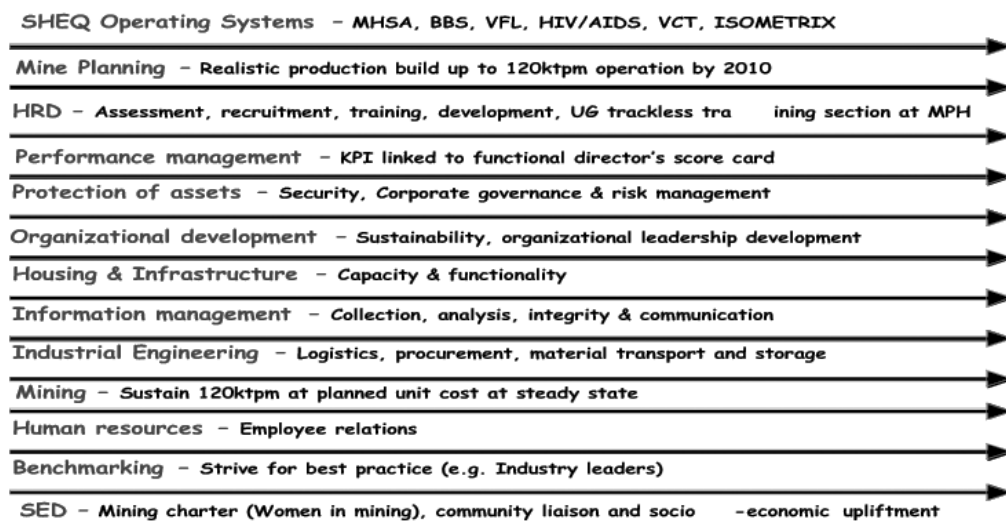


Figure 6. Operational readiness framework



Figure 7. Operational readiness value chain

To achieve this, a culture of building a sustainable organization through leadership will be imparted to all employees recruited or transferred from the existing MR operations. The philosophy is summarized as follows:

- To ensure that the operating environment at Brakfontein is congruent with the technical design and support functions
- To achieve and exceed safety standards required by Anglo Platinum
- To achieve steady state output, head grade and operating costs as per feasibility study
- To embark on optimized accelerated production initiatives (OAPI) where possible
- To comply with the requirements of the Mining Charter particularly in terms of women in mining.

Various organizational development models are available to facilitate smooth transition and systems integration. A simple approach to ensure that a sustainable organization is built has been identified and will be used by the operational readiness team under the guidance of a project manager. This is illustrated in Figure 8.

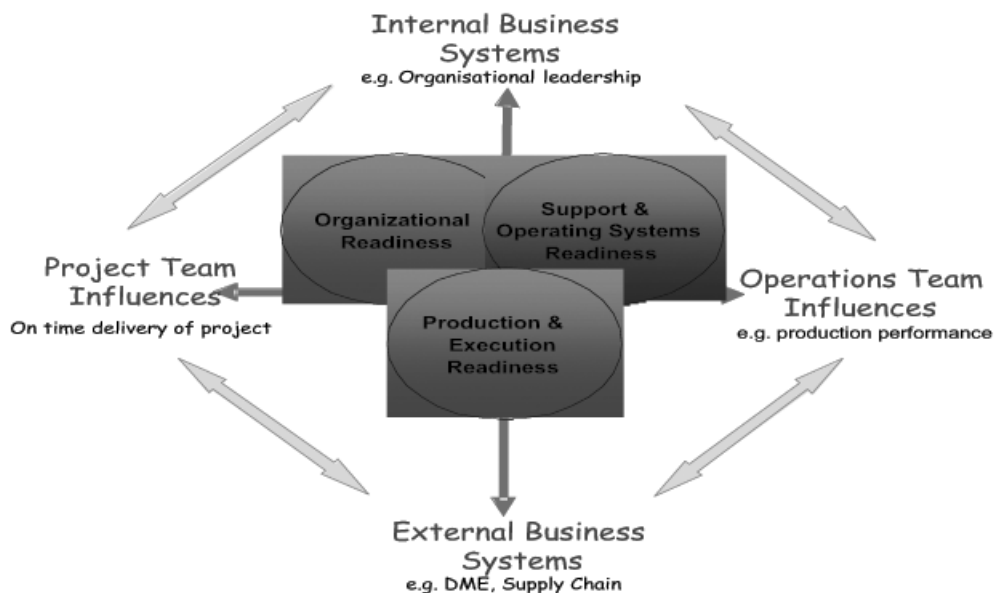


Figure 8. Stakeholder integration model

Table I
Operational readiness team

Designation	Commitments	Remarks
OR project manager	Full time	Coordination and implementation of OR process
OR secretary	Full time	Data capture, office management, skills audit, etc.
HRD manager	Part time	Training needs analysis, Operator Academy, recruitment and development
Recruitment consultant	Consulting	Assessments and selection
Engineering manager	Part time	Engineering infrastructure and housing
Safety manager	Part time	SHEQ operating systems
Production manager	Part time	Mining and best practice
HR manager	Part time	Employee relations and communication
Mine technical services manager	Part time	Mine planning
Accountant	Part time	Setting up cost structure
Supply chain manager	Part time	Procurement
Security manager	Part time	Asset protection

Transition

Operational readiness team

In order to ensure that the framework developed is properly implemented during the transition period, an operational readiness team (Table I) has been assembled from the mine and project staff. Each individual has clearly defined functions, but works with the team to ensure that the objectives of the investment proposal are met.

Labour planning and design

Brakfontein will require 1 641 in-service staff. The current Vertical Shaft MR operations can supply 1 650 people, of whom 791 are already trained to meet Brakfontein requirements. It will be necessary to train the remaining 850 people in mining skills not currently available at the current MR operations, notably those related to trackless development and conveyor belt operations. An amount of R17 million has been provided to train these people between April 2007 and October 2010.

The staffing requirements based on two 9-hour shifts per day, 11-day fortnight is summarized in Table II, while the labour redeployment process is illustrated in Figure 9.

Table II
Staffing requirements

Job category	Number
Mechanized development	150
Raising	112
Equipping and stope preparation	32
Ledging	44
Conventional stoping	1 036
Conveyors	64
Reclamation and construction	24
Engineering and logistics	165
Service (power, water & air)	14
Sub total	1 641
First Line Supervision	20
Mining Management & Admin	98
Total	1 759

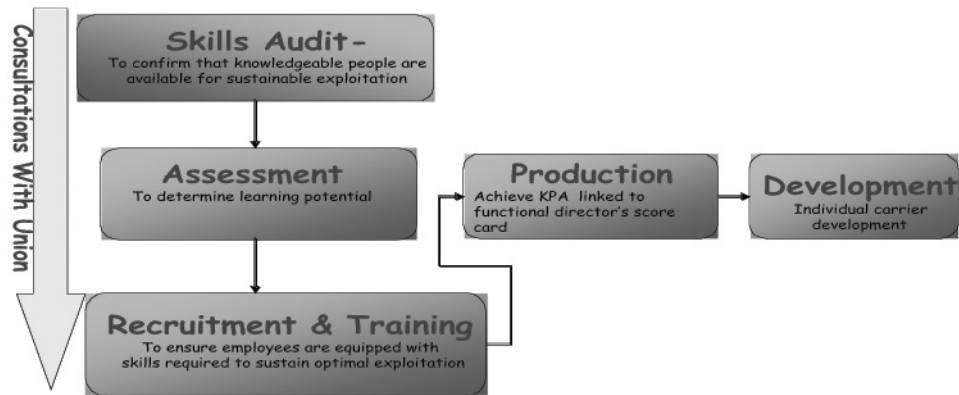


Figure 9. Labour redeployment process

To ensure that knowledgeable people trained with the requisite skills are available, a thorough assessment, recruitment, training and development process in line with Anglo Platinum policy will be applied at Brakfontein. The initial operations crews required for opening up stoping faces will be sourced from the existing MR operations and placed under the control of CDS until completion of the footprint development.

Operator selection and redeployment

The selection process for new trackless equipment operators will provide for a skills profile analysis of all employees followed by psychometric assessments to determine learning potential. This analysis will be carried out by a qualified psychometrics. In addition, mechanical ability and eye-hand co-ordination will be assessment. The involvement of labour unions (especially for brownfields or projects where there are changes to employees' work requirement, in this instance mechanized development opposed to convention development) at the start of the operational readiness process is crucial to address any labour issues.

Training

The training of operators and supervisors to acceptable levels of competency, as well as entrenchment of driver discipline, are vital for the success of any mechanized operation. It is therefore essential to provide for the necessary training programmes well in advance of

commencement of operations. A training facility will be established at LPM's existing Middelpunt Hill mine to provide the requisite training.

The original equipment manufacturer (OEM) is also expected to offer training programmes for operators, which are designed to promote the safe and efficient operation of the equipment, with special focus on the prevention of abuse of machines. The OEM will also carry out ongoing audits of operating practices on an ad hoc basis.

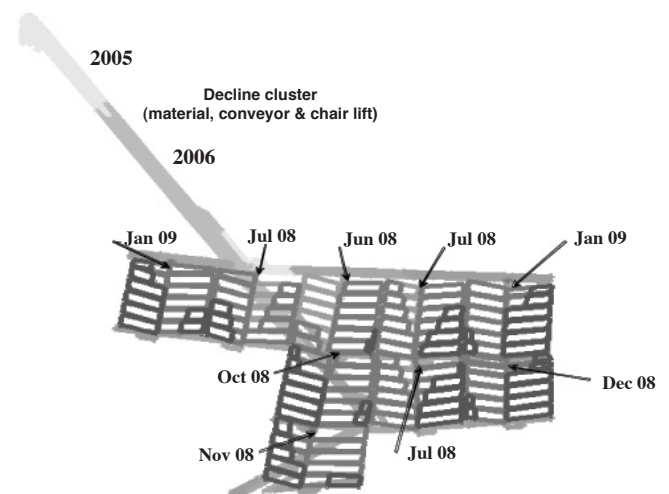


Figure 10. Production schedule to open up stopeable face lengths

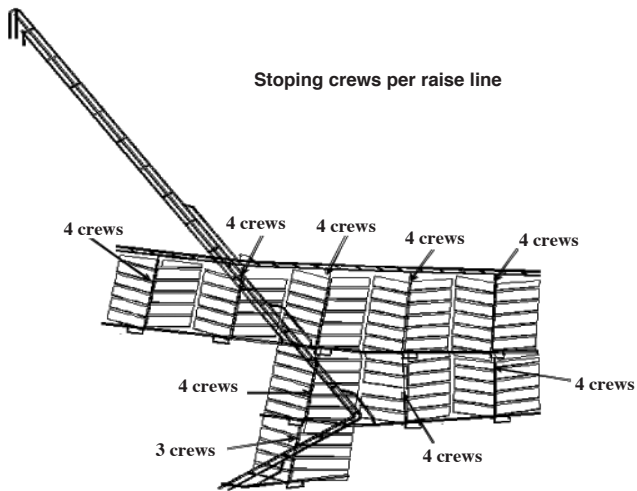


Figure 11. Labour schedule to achieve 120 ktpm

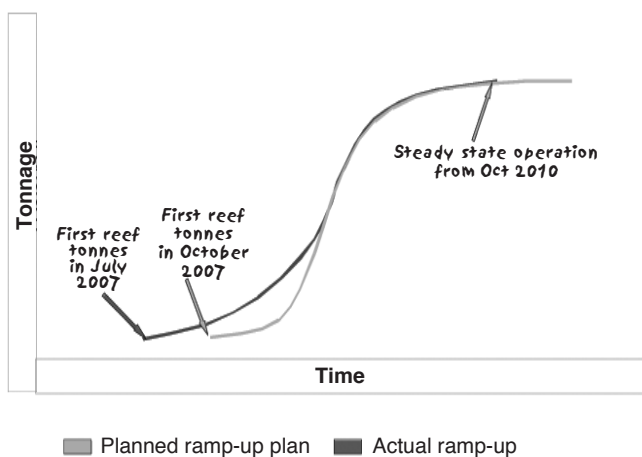


Figure 12. Influence of operational readiness on operational performance

Supervisors and managers will also be provided with full induction and awareness training on the basic functions of mechanized mining equipment.

Production and labour scheduling

As part of the strategy, production of reef planned from winzes developed from the RAW to hole into raises developed from 3 Level. It is anticipated that the first stope reef will be produced in July 2007 compared to October 2007 as planned in the feasibility study. Figures 10 and 11 show the production and labour scheduling respectively.

Conclusion

Operational readiness should not be seen as a commissioning phase event but serves as the bridging block between the project team and operations. To this end it has to be planned, budgeted and scheduled, like any other phase of the project life cycle. This process, if implemented and properly managed, will:

- Ensure that at operational start-up all appropriate operating systems, procedures, information and legal requirements are in place
- Develop and sustain an organization with the appropriate leadership, infrastructure, accountability and workforce equipped with the necessary skills to meet the challenges of a flagship mine.

Current planning indicates that the optimized accelerated production initiative (OAPI) curve shown in blue in Figure 12 will be achieved. Although steady state output will be reached at the same time as predicted in the feasibility study, the build-up is slightly slower.

However, implementation of a sound OR plan increases the probability of success and leads to earlier first ore production. Accordingly it is predicted that the financial indicators and investment returns presented to the Anglo Platinum Board will be met by the Brakfontein project.

Glossary

- *Operational readiness*—an integrated business process put in place to ensure that the capability of a system or equipment to perform its intended design function is achieved. (Operational readiness has to be planned, budgeted and scheduled, like any other phase of the project life cycle)
- *Operational effectiveness*—A measure of the capability of a system to carry out its intended design function. [Function of design]
- *Operational preparedness*—a measure of the degree to which a system is ready to begin that function. [Function of support]
- *Operational readiness framework*—the transition process put in place to ensure that at operational start up, all appropriate operating systems, procedures, information and legal requirements are in place (Function of management support)
- *Business integration*—the processes incorporating the value chain and the business strategy with a view to achieving the project's KPI's (output and cost). (Function of competitive advantage)
- *Organizational development*—the process aimed at developing and sustaining an organization with the appropriate leadership, infrastructure, accountability and workforce equipped with the necessary skills to meet the challenges of a flagship mine. (Function of corporate governance)
- *OAP*—any innovation aimed at enhancing the objectives of the investment proposal. (Function of best practice).

References

1. Anon: Operational readiness, an integrated business perspective. The way forward. De Beers. August 2005.
2. Anglo Platinum: Lebowa Platinum Mines, Brakfontein Merensky Project CBE study. 2004
3. BUTTON, M. and AYLWARD, P. Investment proposal, Lebowa Platinum Mines, Brakfontein Merensky and Middlepunt Hill UG2 Projects. 2005.
4. BACCARINI, D. The logical framework method for defining project success. *Project Management Journal*, vol. 30, no. 4, 1999. pp. 25–32.
5. Dov Dvir. Transferring projects to their final users: The effect of planning and preparations for final commissioning on project success. *International Journal of Project Management*, vol. 23, 2005. pp. 257–265.
6. YU, A.G., FLETT, P.D., and BOWERS, J.A. Developing a value-centred proposal for assessing project success. *International Journal of Project Management*, vol. 23, 2005. pp. 428–436.