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Transfer of Training

— Performance Improvement Plan for Lighting Inc.

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Introduction

Headquartered in Atlanta, Georgia, Lighting Inc. is an international company that provides state-of-the-art electronic products for households. With its focus on innovative product design, Lighting Inc. has a predominant number of engineers among its 74,500 employees. There are 30,200 engineers in 23 offices in the USA and 4,530 engineers in 13 other countries.

For half a decade Lighting Inc. has been the leader of the field. It has been famous for providing cutting-edge electronic products that enhance convenience, safety and comfort of daily life. One of its flagship products is a sensor set mounted on the front panel of a vehicle to reduce the incidence of vehicle tailgating. The sensor could detect the real-time distance between this vehicle and the preceding vehicle. It then transfers the data to the built-in processing unit, which calculates the relative speed of the two vehicles and compares the result with stored statistics, such as braking distance and reaction time. Once the distance between the two vehicles is beyond the safety range, the sensor would trigger an audio alert of the potential danger. Extensive field studies showed that the sensor effectively reduced the occurrence of tailgating. With many state-of-the-art products like this and a large population of talented design engineers, Lighting Inc. has taken a great share of the market. Financial reports showed that Lighting Inc. consistently generated annual net profit of over \$1.8 billion from year 2000 to 2004. For fiscal year 2005, however, the annual net profit did not reach \$1.7 billion. In addition, on the stock market, the quarterly earning per share was continuously \$0.09~ \$0.12, which was 50% lower than the same time of the previous years. At the same time, independent market reports revealed that the rivaling companies, such as KnowWhere, Dwede, and ElectronEye improved the share of market by making similar products available ahead of Lighting Inc.

To attack these critical issues, the corporate leadership settled on two major actions: (1) to recruit young and promising engineers; and (2) to establish an advanced engineering design institute tentatively planned for providing current engineers with a one-month long intensive training. As performance and training specialists, we were assigned to the training program. Instead of taking the task and jumping right onto it, we suggest conducting performance analysis to find out what causes the problem. Rossett (1999) indicated that traditionally when an organization could not achieve the expected goals, recruiting and training used to be the primary interventions being sought. Given a training task, we can design and deliver a well-developed training program. However, our professional knowledge and experience tell us that the current problem is only a symptom, which is usually “evidence of a performance gap” (Rothwell, 1996, p.155). Not all performance issues are caused by knowledge and skill deficiency that can be solved by training (Rossett, 1999). Rummler and Brache (1995) claimed that about 80% of performance improvement problems are caused by the working environment or management rather than lack of knowledge and skills. Based on this information as well as the frequently reported high cost and low payoff of training investment, training and performance experts recommended taking training as the last approach for performance improvement (Broad & Newstrom, 1992; Rothwell, 1996). In our case, there are many possible factors leading to this temporary setback of losing the leading position in innovative product design. It is possible that the engineers do not possess the necessary knowledge and skills to integrate the latest technologies into design, but there are also other possibilities, such as inappropriate organizational climate for performance improvement or poor work processes that impedes the fast rollout of a new product. To determine a remedy for the case, it is necessary for us to conduct performance analysis (Rossett, 1999).

Performance Analysis

The performance analysis was conducted through several steps. During the first step of performance analysis, we located the performance gap by comparing the optimal performance with the current performance of the design engineers. There are different perspectives of the expected performance, which we realized by communicating with senior engineers, management, marketing and sales personnel. The current performance was found out by looking at the engineers' quarterly employee review, which included a holistic assessment of their performance.

Then we identified the potential causes of the performance gaps. Performance improvement experts proposed that there were three levels of performance within an organization: individual level, process level, and organizational level (Rummler & Brache, 1995; Swanson, 1994), and the possible causes of performance gaps may exist at any of the three levels. The setback of Lighting Inc. might be a result of engineers' lack of knowledge and skill or lack of motivation at the job level, or a poor work flow at the process level, or an unfair rewarding system at the organizational level. Rather than providing training based on the assumption that there is a lack of knowledge and skills among the engineers, we used performance analysis to identify the performance gaps, the possible reasons behind them, and to provide various interventions as a solution system. Such endeavors were expected to create more significant and lasting results than settling on training and recruitment only.

To capture possible performance gaps at all three levels, three web-based surveys were conducted among different focus groups that have various professional knowledge and expertise. Experienced managers and directors from all departments contributed thoughts concerning the management and work flow of the organization. The engineers involved in product design provided insight into process-related causes. The senior engineers and the direct supervisors of

engineers helped target the possible causes at individual level. By involving these three focus groups in the survey, they would become more committed to the possible solution actions and a more thorough diagnosis of the current problem.

Table 1 illustrates causes of the performance gap identified through the surveys.

Potential interventions and personnel possibly involved are listed as well, which should inform us about the necessary human resources for improving engineering design.

Table 1. *Analysis and Proposed Solutions to Engineers' Innovation Performance at Lighting Inc.*

Performance Gap	Cause of Gap	Potential Interventions	Personnel Possibly Involved
Lack of competitive product design	Outdated knowledge and skills	Provide training on latest knowledge and skills	<ul style="list-style-type: none"> ▪ Instructional designer ▪ SME
	Lack of project management knowledge and skills	<ul style="list-style-type: none"> ▪ Provide training on project management ▪ Leverage the burden of project management by adopting the workflow and document management system 	<ul style="list-style-type: none"> ▪ SME ▪ Instructional designer ▪ Project managers
	Insufficient understanding of typical and best practices in the field	Benchmark typical practices and best practices of design in the field with EPSS (Rothwell, 1996)	<ul style="list-style-type: none"> ▪ SME ▪ Performance specialist ▪ EPSS designer ▪ Programmer
	Not informed of latest technologies and trends	<ul style="list-style-type: none"> ▪ Set up Really Simple Syndication (RSS) and LISTSERV to keep engineers informed of latest technologies and their application ▪ Establish an online community among engineers at all locations 	<ul style="list-style-type: none"> ▪ Programmer ▪ Engineer ▪ Performance specialist
	Inefficient reuse of previous design	<ul style="list-style-type: none"> ▪ Provide on- and off- job training on design reuse ▪ Establish product design database to promote design reuse 	<ul style="list-style-type: none"> ▪ Senior engineer ▪ Performance specialist ▪ Programmer

As illustrated in Table 1, two main factors account for the current performance problem. The most significant cause is the deficiency of engineers' knowledge and skills. With the development of new technologies, products have shortened life cycles. To understand the new technologies and design more innovative products, it is required that the engineers have updated technical, professional, and project management knowledge and skills. Another factor identified is lack of timely information, including lack of a supporting system that provides updated typical and best practices in electronic product design, lack of information relevant to design reuse, and lack of information exchange among engineers at different locations.

After the identification of the performance gap, the third step of performance analysis is to develop corresponding performance improvement (PI) interventions. Implementation of the potential PI interventions identified in Table 1 is beyond the capability of the current Training and Performance Department. Therefore, we suggest that an institute be set up to provide PI interventions, including training. In addition, the institute will conduct research and develop strategic solutions to sustain performance improvement.

Mission and Structure of the Advanced Engineering Design Institute

Upon our suggestion, the Lighting Inc. Engineering Design Institute (LIEDI) is established. To realize the short-term goal, LIEDI will focus on fulfilling the knowledge/skills gap by providing well-developed training. As the long-term goal, LIEDI is also projected to initiate non-instructional PI interventions and coordinate company-wide efforts to facilitate sustained performance improvement. More importantly, LIEDI will gradually focus on researching and developing proactive strategic plans instead of being a "fireman" for performance issues.

To accomplish these missions and attack the current problem, LIEDI will need a variety of personnel with different functions. Considering budget, the need of the tasks, and the expertise of existing personnel, LIEDI will enlist qualified personnel within Lighting Inc. To fully carry out the missions of LIEDI, externally contracted experts will also be recruited. To initiate the performance improvement efforts, the LIEDI team will have 12 members, who will be responsible for operating the institute and implementing the interventions identified through performance analysis.

Director The director of the Training and Performance Department is placed as the director for LIEDI.

PI specialist Two individuals work as performance improvement specialists. One is from the existing Training and Performance Department. Another will be an externally contracted expert. They will participate in the diagnosis of performance problems and the design, development, and implementation of PI interventions.

EPSS designer One newly recruited database designer is responsible for analyzing data on typical and best practices as well as data on design ideas and procedures of previous product designs. This individual, with assistance from other personnel available to the company, will design and develop the electronic performance supporting system (EPSS).

Programmer & media specialist Two programmers, one internally recruited and one newly hired, are responsible for constructing the EPSS and design reuse database as well as facilitating the development and delivery of in-house training materials. They can be involved in various design activities.

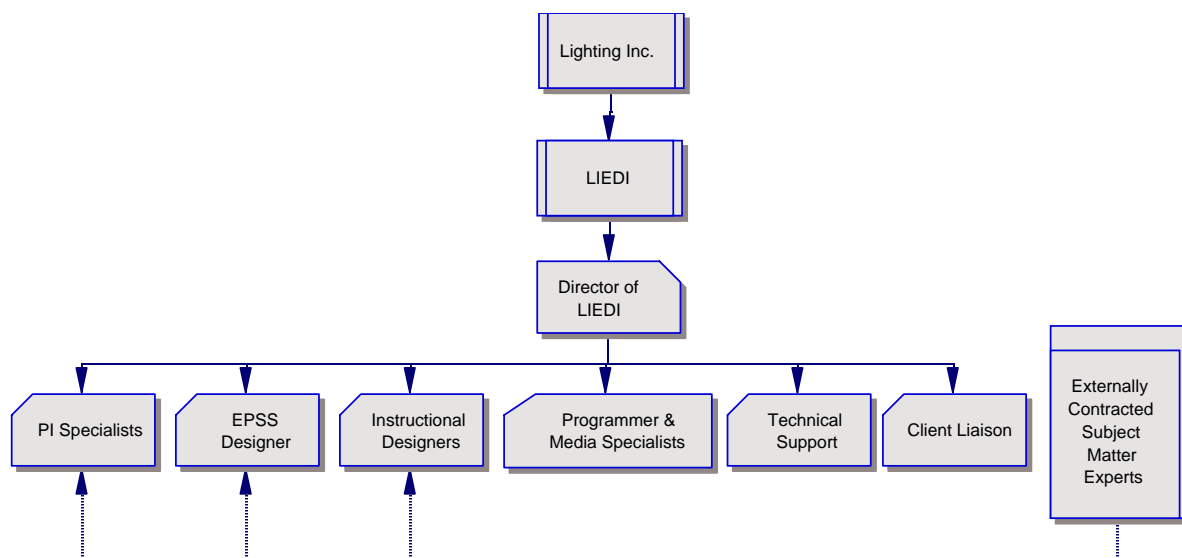
Instructional designer Two existing and one externally hired instructional designers are responsible for designing and developing instructional interventions. They will also participate in evaluating training materials when purchase is needed.

Technical support Two personnel internally recruited are designated as technical support.

Client liaison One individual will be responsible for communicating with other departments and coordinating among different parties associated with LIEDI.

Besides the LIEDI team in the executive committee, we will also recruit subject matter experts (SMEs) with technical, professional and project management expertise. The structure of LIEDI is illustrated in Figure 1 below.

Figure 1. The Structure of LIEDI



Training

With the personnel of LIEDI in position, we start to develop the performance improvement solutions. Referring to the performance analysis results, training programs are selected to ameliorate outdated knowledge and skills. Prior to the design, development and delivery of training programs, training needs analysis is conducted to identify the gap between

the pre-existing and targeted knowledge and skills. Training needs analysis is different from performance analysis addressed previously. With performance analysis we identified the right thing to do. Now that there is a lack of knowledge and skills, the more detailed training needs analysis allows us to “do the right thing right”(Rossett, 1999).

With the consideration of budget as well as efficiency, web-based online survey and focus group teleconferencing are used to collect data on the pre-existing knowledge and skills of design engineers and the knowledge and skills in need. Because of the large population of engineers, it is not realistic to collect data from each engineer. To get data that can represent the general population of the design engineers, 200 engineers are randomly selected. Emails are sent to them inviting their response to the web-based survey. In addition, focus groups are interviewed through the existing teleconferencing system to collect more detailed and specific information. The focus group includes senior engineers who have witnessed the successful history of the company, engineers with top-notch expertise, engineers holding distinguished design patents, engineers with administrative or management responsibilities who can view the company’s situation from both engineering and management perspectives, and newly hired engineers who have the most updated knowledge, skills, and perception of emerging technologies. By doing so, the target trainees’ prior knowledge and skills and their training needs are identified.

Training Objectives

Training objectives are developed in alignment with identified training needs and expected training outcomes. Training outcomes can usually be measured at three levels: learning, individual performance, and organizational performance (Yamnill & McLean, 2001). At the learning level, after the training the trainees will be able to:

- 1) Acquire updated professional and technological knowledge and skills;
- 2) Exercise the strategies of product design reuse;
- 3) Develop teamwork and designer-customer partnership building strategies;
- 4) Incorporate project management knowledge and skills;
- 5) Implement these knowledge and skills to appropriate situations.

However, learning does not guarantee either individual or organizational performance improvement. Thus, even the learning objectives are achieved, they will not result in improved performance without transfer of training, that is, “the effective and continuing application, by trainees to their jobs, of the knowledge and skills gained in training — both on and off the job” (Broad & Newstrom, 1992, p. 6). To constantly improve performance at both individual and organizational levels, strategies for transfer of training need to be developed simultaneously with the training proposal (Broad & Newstrom, 1992).

Rationale and Approaches of Training

When training is identified as a solution, many factors will influence the design choices, such as trainees’ prior knowledge and experiences, their diverse characteristics, the nature of training content, the time and location constraints, the budget, and so on. Taking these factors into consideration, the training will be designed by following these guidelines:

- *Combining off-job and on-job training.* Because of the large engineer population, it is unrealistic to offer all engineers face-to-face training considering the potential expenditure and influence to the normal operation of different Lighting Inc. offices. So we plan to use a combination of off-job and on-job training. In the off-job training, the trainees will leave their working locations and receive face-to-face training at LIEDI. In the on-job training, the trainees will receive training “in the

work setting and during the work" (Rothwell & Kazanas, 2004, p. 5). In order to benefit as many engineers as possible with training opportunities and lower the expense, each of the 23 offices in the United States will send one to three of their engineers to the off-job training site to participate the one-month long intensive face-to-face training. Senior engineers with previous training experiences will be candidates of primary consideration. During the one-month training, these senior engineers will also provide input to the alternative web-based on-job training design and development. At the completion of the training, these trained engineers will supervise and facilitate the online training in respective branch offices. For the rest of the engineers, they will receive on-job web-based training. The regional office at Dallas, TX was selected as the off-job training location considering the population of local employees, facility condition, and transportation convenience.

- *Providing project-based training.* Project-based training in a teamwork setting has been widely used since it teaches learners not only the subject contents but also teamwork, communication, and project management skills in authentic or simulated project-based settings, which are the essential parts of an engineer's work (Bleimann, 2004).
- *Nurturing teamwork.* In their daily work, engineers need to work in teams. The off-job training will simulate this cooperative nature of work. Teamwork will also be implemented in on-job training. In on-job training settings, engineers with diverse professional experience, knowledge structure, and expertise may be assigned in a team. This allows the young and promising engineers bring in fresh ideas and different perspectives while the experienced engineers contribute their valuable

experience, understanding of the organization, and understanding of the whole field (Milne & Leifer, 1999).

- *Exploring design reuse strategies.* Design reuse is a contemporary trend in innovation. It allows design engineers to explore the potential of existing product design and ideas and utilize them in new product design. Design reuse may greatly improve design efficiency (Ball, Lambell, Ormerod, Slavin, & Mariani, 2001).
With a reputable history of innovative design, Lighting Inc. possesses the invaluable potential for design reuse. Besides training on design reuse strategies, a database of archived product designs will be set up and integrated in the EPSS by “encoding and reusing design information” (Ball et al., 2001).
- *Utilizing multiple training approaches.* The training will involve a variety of activities, including workshops, case analysis, in-house problem diagnosis, consulting, and team-based project construction. At the end of training, the design teams are expected to generate prototypes of concept product design.
- *Providing training for the supervisors.* Once training is selected as the solution, strategies to ensure transfer of training should be planned before the actual delivery of training so as to get the most out of the training investment (Broad & Newstrom, 1992). Managers directly supervising the trained engineers will receive web-based on-job training, in which they will learn how to provide appropriate feedback and support to optimize transfer of training as well as strategies of restructuring organizational environment conducive to transfer of training.

Transfer of Training

The investment of training can achieve payoff only through effective transfer of training (Broad & Newstrom, 1992). During transfer of training, many challenges may impede the process. Thus, transfer of training under natural condition only has very limited effect. To foster transfer of training, strategies are needed. In our case, partnership among management, LIEDI, and the trained engineers will be set up for ensuring transfer of training. PI interventions other than training will also be provided to structure optimal organizational climate for transfer of training.

Challenges for Transfer of Training

In this specific training situation, the challenges for transfer of training are identified as:

- Trainees with diversified capabilities, professional experience, educational/cultural background, characteristics, perception of role, and job attitude;
- Varied understanding of performance standards for measuring transfer of training between the engineers and key stakeholders;
- Negative attitudes toward training and training transfer because of lack of feel of equity and ownership, lack of motivation, and inappropriate reward system;
- No feedback or punishment when the engineers apply training to work;
- Working environment different from training setting (Yamhill & McLean, 2001).

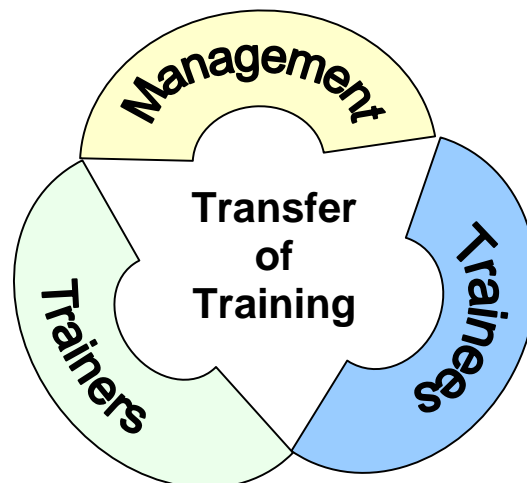
Partnership for Transfer of Training

The attainment of training transfer at work usually fails because managers who directly supervise the work of those trainees do not cooperate or trainers are not able to communicate and align training and non-training solutions within the macro strategic plan of the organization (Broad & Newstrom, 1992). In addition, most of the training initiatives are associated with the

strategic decisions of an organization. Thus, trainees should not be expected to take the full responsibility for transfer of training.

To achieve effective transfer of training, it is necessary to integrate the efforts of management, training personnel and trainees before, during, and after training (Broad & Newstrom, 1992). A partnership among them should be established to optimize the organizational climate for transfer of training. Figure 2 illustrates the partnership among management, trainers and trainees. Each party will contribute to effective transfer of training.

Figure 2. Partnership for Transfer of Training (Broad & Newstrom, 1992)



Managers. Through the on-job training about optimizing transfer of training, the managers directly supervising the trained engineers will learn principles of providing performance feedback. They will be informed of the training objectives, contents, procedure and expected outcomes for engineers. They will also be suggested to review training materials and to participate in assessment. To ensure quality assessment system for transfer of training, managers will be facilitated through online consulting to set up supervisor/trainee assessment contracts.

Trainers. Trainers will be informed of the organizational strategic plan so that they can align training and other performance interventions with the macro strategic plan. In addition, LIEDI team will hold regular focus group video conferences among engineers, management, and marketing and sales personnel to collect feedback on transfer of training. Effective practices will be integrated into future applications.

Trainees. The trainees will negotiate with the management about opportunities for practicing training content and set up supervisor/trainee contracts about performance improvement. They will also be encouraged to record and submit their suggestions about how transfer of training will be enhanced based on their back-to-work experience.

Other Performance Improvement Interventions

As identified through performance analysis, there are other causes for performance gaps, which can be solved through non-training interventions. Among them lack of timely information about typical and best performance is one of the contributors to failure of performance improvement. In addition, each year with about 1,000 new engineers recruited by Lighting Inc., if training were selected, the annual cost would be over \$2 million (Rothwell, 1996). Interventions such as EPSS, online community and mentoring are cost-effective alternatives to provide information service and get new comers trained.

EPSS. An electronic performance supporting system (EPSS) will be set up and updated constantly. The EPSS will provide timely and systematic information of benchmarked typical and best practices of the field. The accumulated designs unique to Lighting Inc. will be archived in a knowledge management system in the same EPSS to provide references for design reuse.

Online Community. Online community will be facilitated with Really Simple Syndication (RSS), Listserv and desktop video conferencing so that the most updated product

and technology trends can be shared among design engineers. Besides, a discussion platform is provided so that engineers across the whole company can easily share and exchange information, including problems encountered and possible solutions.

Mentoring. Each year Lighting Inc. recruits about 600 new engineers in the US and 380 in international branch offices. The newly recruited engineers may have updated knowledge and skills. However, they may need to be informed of “what to do”, “how to do it” and “how to cope with...organizational politics” (Rothwell & Kazanas, 2004, p. 8). Mentoring programs are more appropriate to get the new engineers adjusted to the organizational settings and do not demand high cost.

Assessment Plan

Rummler and Brache (1995) state that a good assessment procedure will help sustain the improvement of performance. Their investigation indicates that among many of the organizations that initiated some types of improvement, very few have sustained the success for a long time. One of the reasons is that the initiatives often did not have accompanying measurement and feedback system built in the business procedure. To help engineers continuously transfer training to work and sustain their performance improvement, it is essential to have a well-established assessment plan and feedback system.

Our assessment plan will evaluate outcomes of both training and transfer of training. Each part of the plan has its own built-in feedback system. As the immediate training results, each design team will present their concept design at the end of training. Experts and their peer teams will provide formative feedback based on the rubrics, which will be established by consulting representatives of senior engineers, management, and SMEs. With this feedback the

design teams can fine-tune their concept design, bring them back to work settings, and continue developing them.

To measure how much the individual engineer, the engineering design teams, and Lighting Inc. as a whole benefit from the transfer of training interventions, it is necessary to know if the trainees' performance is improved as the results of training and transfer of training. Pre-/post-assessment will be used to measure the change. In the pre-assessment, data will be collected from business management level and from the trained engineers about their prior performance in the field. In the post-assessment, transfer of training will be assessed at the design milestones, which will be complemented with annual performance review.

Hale (1998) indicates that assessment plans should start with clearly identified goals and measuring criteria. Compared with measurable skills, such as cargoes transported by truck drivers or sales records of a pharmaceutical sales representative, however, the electronic product design by engineers is hard to measure. Furthermore, the process of innovative design usually takes a substantial time span (Gaynor, 2002). So, not confined by the regular assessment occurring at a fixed interval, the milestone assessment will be adopted, in which criteria will be set up to measure the quality of progress and the time it takes to get to major stages. At the major milestones, a design review panel consisting of senior engineers and marketing and sales personnel will evaluate the outputs at respective stages of engineering design. Besides, a yearly assessment will be conducted for five consecutive years after the training to identify trainees' performance improvement. Various data from trainees' peers and direct supervisors will be collected to see if the trainees continuously improve their performance. In addition, the design engineers will go through regular employee quarterly review. The milestone and yearly assessment will constantly gauge and adjust the performance quality of design engineers.

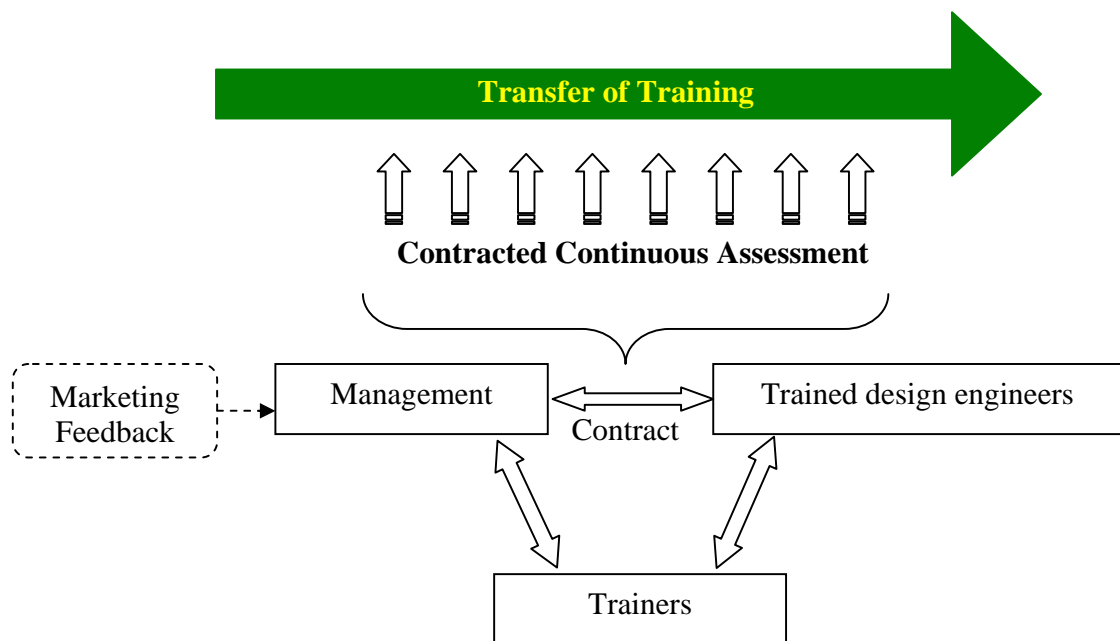
To achieve transfer of training and sustained performance improvement, a contracted continuous assessment model involving three parties in the partnership for training transfer will be applied. The contracted continuous assessment is instrumental to enhancing transfer of training in that it is based on mutual understanding and agreement about the expected performance improvement goals and the actions required to achieve these goals (Robinson & Robinson, 1995). A written document will ensure that people involved understand they have shared responsibilities to achieve the goals. With such an assessment plan, design engineers and other employees will be invited to actively participate in planning and implementing assessment, which will enhance their commitment to transfer of training and performance improvement.

As indicated in Figure 3, the criteria of proposed assessment model are influenced by several factors. Through contract, the trained engineers and their direct supervisor will negotiate expected performance outcomes and establish contracted assessment standards to measure transfer of training. The trainers will facilitate this process by providing the management with access to training content and procedure as well as strategies for enhancing transfer of training. In addition, the trainers will provide engineers with extended training opportunities and the typical/best practices through EPSS. The trainees will provide feedback to management and trainers about their perception of and suggestion to the transfer-of-training-friendly organizational climate. Moreover, the feedback from trainees about the effectiveness of training will help trainers modify subsequent training in the long run. Marketing feedback will also impact the management assessment perspectives.

Besides the milestone and annual assessment with feedback, the continuous assessment will shape transfer of training at work setting. During daily work the prompt feedback with necessary support from managers directly supervising design engineers is critical to transfer of

training (Yamill & McLean, 2001). “Without feedback, good performance can fall off track, and poor performance can remain unimproved” (Rummler & Brache, 1995, p. 72). To help managers provide feedback with immediacy, frequency and specificity, training and online consultation will be provided.

Figure 3. Contracted Continuous Assessment Model



A summative evaluation determining the effectiveness of training/transfer of training will also be conducted by an evaluation committee composed of performance specialists, senior engineer representatives, and management personnel. Whether the engineers improve their performance in innovative product design will be investigated through collecting and analyzing data on the number of products designed by each team, the profits generated from the new products, and the intellectual property, such as patents and trade marks filed (Rogers, 1998) prior to and after training. The results will be compared through the subsequent five years.

Summary

The engineers' product design performance is critical and fundamental to Lighting Inc.'s success. We believe that the training programs, the partnership for transfer of training strategies, and other performance improvement initiatives adopted in this proposal will result in both short-term and long-lasting performance improvement. With the understanding that the performance of personnel in other departments, such as manufacturing, marketing and sales, and post-sale services, will also contribute to the organizational performance, we suggest a company-wide performance analysis and intervention plan be developed if steady performance improvement is required.

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