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Mentoring and IT Education: Program Planning and Evaluation

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ABSTRACT

Increasingly, universities are developing and implementing mentoring programs in an attempt to bridge the gap between classroom theory and its application in the real world. Participating in mentoring programs also allows students to develop a realistic view of the workplace, identify careers that are suitable for them and network with industry professionals. However, to date, evaluations of mentoring programs to support learning in Information Technology (IT) programs have been limited. This paper discusses the importance of university mentoring programs. It describes a pilot project for a mentoring program in Information Technology Management (ITM) at a Canadian University, outlines the components and design of a comprehensive evaluation program and identifies areas for further research. The objectives of this research are to explore the importance of mentoring in IT education, to describe the mentoring process and to discuss the evaluation of mentoring programs. A framework for evaluating mentoring is provided.

KEYWORDS

Mentoring, evaluation, IT education

INTRODUCTION

Mentoring is not a new concept but has attracted attention in recent years as a way of socializing and developing employees, as a means of providing role models and support for under-represented groups and, more recently, as a means of improving student performance and retention in universities. Mentoring has been defined as "a deliberate pairing of a more skilled or experienced person with a lesser skilled or experienced one, with the agreed-upon goals of having the lesser skilled person grow and develop specific competencies" (Murray, 1991). While informal mentoring often occurs by chance, formal mentoring programs have defined objectives, roles and responsibilities. (Armstrong et al., 2002). Formal mentoring programs are described as a "type of benefit based, calculated relationship" which is enabled by specific preconditions that exist in the organization. This theory of reciprocity is said to underscore mentor-protégé relationships: they hinge on the achievement of benefits by both the mentor and the protégé. In these programs, experienced professionals, called mentors, share their knowledge and experiences with less experienced personnel, who are called protégés. A mentor transmits knowledge and experience to the protégé in the form of guidance, advice, support and feedback (Kerta, 1998). As a trusted counsellor, guide or supervisor, the mentor may assist the protégé in achieving one or more specific tasks such as acquiring new job skills, setting and achieving career development goals (Lee, 2002), familiarizing the protégé with workplace cultural requirements, and showing how theory is applied in practice (Dutton, 2003; Jacobi, 1991). Essentially, the mentor imparts knowledge and/or skills that are difficult for the protégé to acquire from instruction in a classroom. There is an extensive literature on the theory and practice of mentoring and on the factors which contribute to "successful" programs.

FORMAL MENTORING PROGRAMS IN INFORMATION TECHNOLOGY

In Canada a wide range of organizations have formal mentorship programs aimed at acculturating and encouraging the success of new recruits, managers, and specific populations, such as women. For example, Bell Canada, IBM Canada, the Royal Bank of Canada, Canadian Tire, Rogers Communications, and The Bank of Nova Scotia are among the companies with formal mentoring programs (see, for example, www.peer.ca/mentor.html). Professional associations such as the Canadian Information Processing Society (CIPS) have formal mentoring programs for information technology professionals (CIPS, 2003). Among the benefits organizations obtain from formal mentoring programs are improved performance as well as the ability to recruit, retain and manage well-qualified staff (Holloway, 2001; de Janasz et al., 2003; Chao et al., 1992; Megginson, 2000). Mentoring programs may be undertaken at virtually any stage of career development; for example, some

programs are aimed at socializing new recruits, others at grooming "high flyers", and others at providing support at particular stages in a career (Jowett, 1994). Women who lack access to traditional networks of influence, and are disadvantaged in male-dominated careers such as information technology and computing departments, benefit significantly from mentoring relationships (Burke and McKeen, 1990; Noe, 1988; Ragins and Sundstrom, 1989). Mentoring programs are considered to play a significant role in the career success of young employees (Aryee et al., 1996). The mentoring program at Ryerson University is a formal program that provides mentoring opportunities throughout the undergraduate years of study.

In universities there is a growing awareness of the need for learning to extend "beyond the classroom and to link everyday life to classroom so as to create real meaning for the learner" (Breci and Martin, 2000). Mentoring students with industry professionals provides the opportunity for learning beyond the classroom. Undergraduate students in a business program who spend time in a business environment are shown to have increased their learning (Stewart and Knowles, 2003). Almost half of business schools in Canada and the US now have mentoring programs in place (Schlee, 2000; Cukier and Chauncey, 2004). Students understand how theory is applied in the workplace, they grasp the importance of having to study subject concepts, and they appreciate how the academic program prepares them for their chosen careers. Mentoring programs are good alternatives when co-op programs or internships are not available.

Many professions – law, accounting, nursing, medicine and teaching – have relied heavily on "apprenticeship" and mentoring approaches. In areas of science, technology and engineering, mentoring has been examined primarily as a means of attracting and retaining under-represented groups to study, work and teach. For example, MentorNet, an on-line mentoring program for women in science and technology, has more than 80 participating post-secondary institutions in the USA and Canada (MentorNet, 2004). However, there is another important dimension to consider: the way in which the study of information technology management can be enhanced. The study of Information Technology Management focuses on understanding of the application of system development theory, the performance of business processes, and the link between information technology and corporate objectives. It has been suggested that all students in IT business programs, like their counterparts in other established professional programs should have a component of the program reserved for study in actual business organizations (Kleinman et al., 2001). While courses on security, systems analysis, applications software, operating systems, network services, data management, the internet, systems administration, and customer support can be taught in the classroom, and the theory reinforced by the completion of projects which simulate the real-world, there is no substitute for actually participating in a project in the workplace under the supervision of a mentor. The importance of applied learning and career preparation is well-understood in the IT sector. More than 100 universities in North America operate or participate in mentoring programs related to computer science and information systems in order to support applied learning.

THE TRI-MENTORING PROGRAM AT RYERSON UNIVERSITY'S SCHOOL OF INFORMATION TECHNOLOGY MANAGEMENT

The School of Information Technology Management (ITM) at Ryerson University is a unique, undergraduate, academic program in which students study traditional business courses as well as information technology courses. Most of the full-time students are high school graduates who have little or no work experience in the IT industry. In some cases, these students are not aware of the career options that exist in the field nor do they understand the differences among the streams they select in the program which include: applications development, networks, digital media, enterprise systems and knowledge management. The Tri-Mentoring Program is a university-wide program with several phases. The first phase is aimed at improving the students' adaptation to the university environment. During the first year, the student is paired with a trained third-year student mentor to help facilitate the orientation and transition into university life. The objectives in the first phase include:

- to receive support and guidance to help with questions, concerns and the overall adjustment to Ryerson University;
- to identify informal work requirements taught outside of the classroom;
- to access additional free resources such as English tutoring, writing skills, learning skills and peer tutoring, to help students succeed;

The second phase is aimed at developing the student's leadership and coaching skills. In the second year former protégé enrolls in a Student Leadership and Education Program, designed to help them develop skills and training in peer support, team work, communication, and problem solving. When the student reaches the third year, he or she becomes the mentor to a first-year student. At the completion of the mentoring program, students receive a leadership certificate. As a result of participating in the program they develop skills in conflict resolution, communication, and problem-solving.

- to develop confidence and communication skills

- to develop leadership and coaching skills.

The third phase is in the fourth and final year. The student is paired with a mentor from their field of study and through this arrangement, develops industry networks, job opportunities and employability skills. In addition to providing career related mentoring, this stage helps develop the student's understanding of how theory applies to practice in organizations. Objectives of this phase include:

- to network with professionals in the desired study area.
- to enable students to apply classroom knowledge in the real-world;
- to promote informed career decisions;
- to formulate realistic expectations of the world;
- to enhance preparation for the workplace;
- to assist students in their transitions from university to full-time employment; and
- to provide insight into the possibilities of pursuing graduate studies

The pilot project involves 25 students and 25 external mentors recruited from industry, many of them employed graduates of the ITM program. The program structure includes the four essential components of a formalized mentoring program (Gray and Gray, 1985).

- 1) Identifying and matching the mentors and protégés based on personal preference and interests.
- 2) Training the mentors and protégés with written guidelines and orientation sessions.
- 3) Monitoring the process through periodic surveys of students, informal feedback and social events.
- 4) Evaluating the process to assess its design and effectiveness.

While it is too early to evaluate the program beyond simple process and outcome measures, a plan has been developed to provide a comprehensive evaluation. This has proved to be one of the most challenging aspects of the program and is discussed below in further detail. Another unanticipated aspect of the program is the amount of time and resources required to coordinate and manage it.

EVALUATION

Evaluating the Tri-Mentoring Program

The purpose for evaluation is to identify which objectives are achieved and which are not achieved so that continuous improvements can be made to the program. But developing an effective evaluation of mentoring is not easy and requires extensive knowledge and understanding of all the program components (Gibb, 1994, 1999). Mentoring is a complex activity involving mentors, protégés, mentor-protégé relationships, outcomes, activities, mentoring models, enabling technologies, and procedures, each of which must be scrutinized during the evaluation process. Failure to review each of the above individually as well as collectively will diminish the results of the evaluation. To date, reviews of mentoring evaluations have suggested that most are fairly limited, focusing on design (process evaluation) participation and satisfaction rates (impact evaluation), rather than assessing outcomes and the extent to which they meet their objectives (Cukier and Chauncey, 2004). Different levels of evaluation are possible. While it is possible make a logical argument that a well-designed mentoring program, which has high levels of participation and satisfaction, will also have a positive effect on the participant's educational and career success based on previous studies and theoretical models, formal evaluation of outcomes, while difficult, is more persuasive.

To develop a meaningful evaluation scheme for the Tri-Mentoring Program it is important to fully encompass all the critical elements of the program. Developing a program evaluation model is, in itself, a complex activity consisting of five phases: the program analysis and assessment, the evaluation design, evaluation methodology development, implementation and administration, and communication of evaluation findings (Darabi, 2002).

Evaluating the Process: Definition of Mentoring, the Scope of the Program and Program Design

Process evaluation focuses on the way in which the program is structured and its key activities. It is defined as the study of what goes on while a program is in progress – its implementation. (Weiss, 1998) It focuses on the elements of the program.

For example it would consider the scope, goals and objectives of the program because how mentoring is defined is key to how the program is perceived and structured (Gibb, 1999). Why is the program required? For whom it is required? What is required by the participants? What are the key activities? What resources are needed to deliver the program? How will the program achieve its goals? What are the expected benefits and outcomes? When will the benefits and/or outcomes be realized? In general, the indicators used in process evaluation are primarily descriptive and the focus is on evaluating the plan and its implementation.

Evaluating the Impacts: Focus on Mentor-Protégé Relationships

Impact evaluation focuses on assessing effects and short term results. While sometimes used interchangeably with outcome evaluation it can be more precisely defined as the assessment of the effect of a particular intervention. (Weiss, 1998) This type of evaluation investigates questions such as: Have knowledge and attitudes changed? What benefits do participants (mentors as well as protégés) believe that they have gained? and What are the costs associated with the program? Several researchers have cited the mentor-protégé relationship as a key aspect of the mentoring process (Johnson et al., 1999; Richie and Genoni, 2002; Noe, 1988). As the mentor-protégé relationship has been identified as a key factor in determining satisfaction of participants, understanding this relationship is critical as it evolves along with the mentoring phases (Chao, 1997). The outcomes of mentoring also evolve with each phase of mentoring. Regardless of the focus of mentoring, this relationship is what determines whether the program outcomes are achieved (Gibb, 1999).

The quality of the “the match” between mentor and protégé as one important predictor of success however the research is less conclusive about the factors that affect the quality of the match. Dyadic evaluations require examining pairs of mentors and protégés. However, a review of the literature shows very evaluations of dyadic relationships. One exception is the 1998/99 evaluation of MentorNet, an email based service for female students in science and engineering. Seventy percent of respondents reported that MentorNet was worthwhile and 50% continued their relationships with their mentors or applied for new mentors within the following academic year. The study noted that the female protégés with female mentors were more likely to be satisfied than those with male mentors. The evaluation also suggested that there was a strong correlation between the quality of rapport and the satisfaction levels reported by the protégés and the mentors. While this level of satisfaction is encouraging, more exploration of the sources of dissatisfaction among the 30% who were not satisfied or the 50% who chose not to continue would also have been of interest (SJB, 2002).

Assessing the mentor-protégé relationship requires a careful examination of its key elements, which include selection criteria for both protégés and mentors; their availability and level of participation; and degree of satisfaction with outcomes and benefits. The design of an evaluation must also fit with the program model. There are important differences between the traditional (one-to-one) model and the alternative group model (in which one mentor is assigned to more than one protégé) which must be considered (Ambrose, 2003). Furthermore, the mode of mentoring communication—for example, tele-mentoring, e-mentoring, face-to-face mentoring, or job shadowing—and the unique features of each mode also have to be considered in the development of the evaluation model.

Evaluating Outcomes: the Short-term and Long-term Effects of the Mentoring Program

Outcome evaluation, the most important and most difficult form of evaluation, aims at assessing whether or not, at the end of the day, the program achieved its stated goals. (Weiss, 1998) While impact evaluations often assess “proximate measures” which could be assumed, based on other research or theoretical models, to produce the desired results, the only real way to assess outcomes is through comprehensive and longitudinal studies. The questions that outcome evaluations answer are: Did the program affect success or achievement? Was there an effect on the retention of participants in the program? What are their prospects on graduation? Did the program have an impact on the careers of the mentors? Clearly the most challenging aspect of the ITM mentoring program will be the requirements to track and monitor the progress of the protégés over time and to try to isolate the impact of participating in mentoring program versus other factors.

	Questions	Variables in Mentoring to Assess	Challenges/Limitations
Process	Is the program reaching its intended audience? Are the elements of the program well-designed?	What are the elements of the program? Do the elements of the program design form a coherent whole?	What is the conceptual basis for the program design?
Impact	Have knowledge and attitudes changed? What benefits do participants (mentors as well as protégés) believe that they have gained?	Participation rates and demographics Quality of the match Factors affecting quality of the match (dyadic analysis) Frequency of communications Perceived benefits (mentor and protégé) Costs	What is the link between the impacts and the outcomes?
Outcome	Did the program achieve the desired results?	Improved retention Improved performance Value for money evaluation	How do you control for other variables? How do you collect longitudinal data?

Table 1. Summary of Evaluation Components

Comprehensive Evaluation of the Tri-Mentoring Program

In order to undertake a comprehensive evaluation of the Tri-Mentoring Program, it is clear that a variety of evaluation techniques must be used. In addition to the use of surveys to collect data related to outcome evaluation, case-controlled evaluation should be conducted. The data gathered on the student participants should be compared to students with similar characteristics who did not participate in the program. Such a comparison will give more credibility to the overall results of the evaluation. A longitudinal study should be done to track the impact of mentoring over time.

It is also important to explore limitations of the program, the costs (including actual and opportunity costs, and the relative value of this intervention compared to other forms of support. This is particularly worthwhile in environments where there is competition for scarce resources. In contrast to the literature on mentoring in organizations, we find no discussion on the costs associated with mentoring and e-mentoring programs in universities. Examples of costs include salaries of administrative staff, expenses related to the technology needed to support the program, facilities to accommodate the mentoring activities, and program events. The information obtained from evaluating the mentoring programs can be used to substantiate requests for funding. Further, the costs and benefits of mentoring programs should be assessed comparatively as an alternative to other experiential learning opportunities, such as co-op programs and internships.

AREAS FOR FURTHER RESEARCH

The ITM mentoring program is in its early stages and it is hoped that by undertaking a systematic approach to program design, implementation and evaluation that a contribution will be made to the theoretical and empirical literature on mentoring. There are a number of general areas for further research that have emerged through the course of this paper which could be the focus for further research including:

- A systematic review of the extent to which formal university mentoring programs are in place to support students enrolled in IT-related program, the evaluation approaches used and the results;
- Development of a stronger theoretical model showing the links between variables considered to contribute to successful mentoring programs and showing the linkages between processes, impacts and outcomes;
- A survey of best practices in program design for successful mentorship programs based on existing evaluations;
- A comparison of mentoring program benefits and costs to those of other types of experiential programs, such as co-op and internships.

CONCLUSION

Mentoring programs in universities are used to enable students to bridge the gap classroom learning and the workplace. Often students have difficulty getting a full understanding of classroom knowledge. The mentoring programs discussed in this paper are designed to broaden students' knowledge and to develop the acquisition of skills that are not easily attained from course work. The practice of mentoring in Business and IT programs is as important as the experiential programs students in medicine and law routinely undertake as a requirement for completing their professional studies. While educators in Business and IT know that the application of theory is vital to acquiring subject knowledge, only recently have they been beginning to develop formal mentoring programs to provide experiential learning beyond the classroom. This paper presents an overview of Ryerson University Tri-Mentoring Program and discusses how students in the Information Technology Management program develop skills and acquire knowledge by participating in the program. Within the next academic year the Tri-Mentoring Program will be evaluated; consequently, it is necessary to examine the types of evaluations that are appropriate for the program as well as the key issues each type of evaluation entails.

The literature on the evaluation of mentoring is limited. We discuss the need for a comprehensive evaluation of the Tri-Mentoring Program. While studies have suggested that mentoring programs have much to offer both mentors and protégés (particularly disadvantaged groups), the precise nature of these benefits is less clear because of the limited extent of formal evaluations. Experiences in other professional programs—accounting, law, business, etc.—suggest that mentoring can be built into educational and professional programs. Further research would help us understand whether or not mentoring should be incorporated as a standard feature for Information Technology Management.

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