Using Actor-Network Theory to Analyze the Construction of the Failure Concept in a K-12 ICT Integration Program

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Abstract

The integration of information and communication technologies (ICT) into educational systems is one of the greatest challenges faced by educators and policymakers. Despite high-profile efforts, and significant investments of resources, ICT integration programs in the K-12 system generate plenty of talk about *failure*. This study explores the construction of this *failure* concept in the Israeli national ICT integration program. An application of actor-network theory to the national program, as well as to a local ICT integration program, reveals significant differences in the networks of the two programs. We propose that five of these differences point to possible causes for the increased level of talk of failure in the national program. The promise and limitations of applying actor-network theory to reach a deeper understanding of ICT integration programs in the K-12 system are discussed.

Keywords: actor-network theory, K-12 education, ICT integration

Introduction

"Since the invention of the motion picture, teachers have been intrigued by the potential of technology" (Hew & Brush, 2007, p. 224). Despite the great promise of technologies, the challenge of effectively harnessing technologies to benefit learners educators and administrators is still great. This challenge is most apparent in regards to the efforts to integrate information and communication technologies (ICT's) in schools. Despite significant efforts and resources invested in ICT integration programs in various school systems, we find a disproportionate number of reports of *failure* of such programs. One of the labels this phenomenon has received is *technological paradox* (Salomon, 2000) a term that describes how the more deeply technology is integrated in learning and teaching, the less it influences the educational system in general, and the learner in particular. The motivation for this study is the abundance of reports of failure related to the national ICT integration program in the Israeli K-12 educational system. (Chen, 2006; Zinder, 2006; Melamed, 2008).

In this study, we apply actor-network theory (ANT) to understand the construction of the concept of *failure* in the national ICT integration program. Unlike the extensive literature that explores this failure through the lens of disciplines such as educational management, philosophy of education, or management, (Kozma, 2003; Chen, 2006; Law, Pelgrum, & Plomp, 2008). ANT allows us to study issues related to information systems in the context of social constructivism (Tatnall & Gilding, 1999; Lamb & Kling, 2003): ANT is a theoretical framework used in social studies of technology to explain the way technological artifacts are constructed in society. Under this framework, the actants (both human and non-human entities) are identified, and networks in which they are embedded are explored, in order to identify ways in which social context is bound up with the different actants (Latour & Woolgar, 1986). One of the significant advantages of ANT

in relation to alternative approaches to understanding technology-rich programs is that it treats both people and technological artifacts symmetrically and thus can expose relationships and contexts which are more difficult to detect using other approaches (Tatnall & Gilding, 1999; Doolin & Lowe, 2002). It is important to note that despite the fact that ANT studies a socially embedded *network*, it should not be confused with SNA (Latour, 1996).

Research Question

Given the unique power of ANT in analyzing heterogeneous, technology rich networks, ANT was applied to answer the research question:

> How is the concept of *failure* constructed in discourse related to the national ICT integration program in Israel's K-12 educational system?

Methodology

The Actor Network Theory methodology employed in this study is based on the work of Latour and his colleagues. The term "Actor network theory" was devised by Michel Callon in 1982. (Latour, 2004; Latour & Woolgar, 1986; Law J., 2007), and refers to a theoretical framework which describes the world as a network of hybrid (social and technological) actants. In this network it is possible to study both people and technologies using the same tools. ANT's postulation that the social and technological should be studied on an equal footing is most productive when applied to cases in which the social and technological are embedded in each other (e.g. Elbanna, 2009).

This study analyzes the Israeli national ICT integration program for the K-12 educational system. The analysis was based on a comparison between the talk of *failure* associated with the national program, and the talk that surrounded a second ICT integration program. This second integration program was a small-scale municipal program. The talk associated with this program was more neutral, and included more references to success, and fewer references to failure. An ANT analysis of each of the two programs was followed by a comparison of the two networks. Significant differences between the two networks were identified, and those which might explain the construction of the failure concept in the national program are highlighted and discussed.

The ANT analysis in this study is based on the careful reading of textual documents such as transcripts of interviews with a middle school principle, an ICT coordinator in the ministry of education and a policy maker involved with ICT integration in education in Israel.; Media reports, evaluation reports, parliamentary committee protocols from the Knesset and the ministry of education, power point files of presentations by policy makers in the Israeli Ministry of Education, ICT integration projects' websites, blog posts of ICT integration experts, academic articles, and various other reports. The analysis was carried out by a researcher who has been and currently is affiliated with several ICT integration programs in Israel's educational system, including the small municipal program that has been used for comparison purposes. In total, the number of individual resources analyzed in this study is 67. The texts were analyzed for references to failure, as well as for references to success. Following several iterations of analysis, two networks have been drawn. In addition, due to the large number of actants and possible relationships, a two-dimensional matrix was used to explore all possible relationships between each pair of actants.

Results and Discussion

An outline of the networks of the two programs is presented in Figures 1 and 2. For presentational reasons, the outline shows only the names of the actants, and the existence of uni- or bi-directional

relationships. The two dimensional matrix is not presented due to size limitations. A comparison between the actants and networks of the national program and of the municipal program revealed many differences. In this section we describe the differences which are most likely to shed light on variations in the construction of the concept of failure of the program.

Actant Identity: Non-Profit Organizations

The analysis revealed that the network of the national program includes an actant which is quite conspicuously missing from the municipal program: non-profit organizations. These organizations play an important role in the national program as suppliers of infrastructure, of knowhow and of technological products. In addition, they act as program leaders in some of the local programs. How could this difference be related to the talk of failure in the national program? The key role of these nonprofits in the national program is related to the goal of closing the digital (or ICT) gap. Closing the ICT gap is mentioned as one of the goals of the national program. It is reasonable to assume that the non-profits, who collaborate extensively with the Ministry of Education on closing the ICT gap in schools, have an interest in creating extensive public relations about their work. When we examine their press releases, pamphlets, websites, etc., we find that they target parents and tend to treat them as spectators. They convey to them messages which describe previous efforts as not successful by emphasizing the depth of the ICT gap, and the need for further investments. We do not find evidence for messages from the Ministry of Education which counter these messages of failure which emanate from the nonprofits.

Actant Roles: The Role of Parents

There are several important differences in actant roles, and the most interesting one appears to be in regards to the role of the parents. In the national program, parents play the role of regular actors, while in the municipal program, the analysis reveals that their role is that of mediators. Mediators are described by Latour as a special category of actants which role in the network is to modify or transform (Latour, 2005). Our analysis showed that the parents in the municipal program are mediators who interact with many of the other actants, and should thus be studied closely. As a part of these relations they have a representative in the program's steering committee, and they receive information which is provided to them by the local municipality. On the other hand, in the national program, parents are an actant who receives information from the non-profit organization, from school principals, and from teachers, but we do not find a link of information flow or cooperation with actants such as professional committees, parliamentary committees, or decision makers. Moreover, if we explore the networks for other key sources of information for parents about the program, we find that it is their children who inform them. These children are usually digital natives who perceive their teachers (and often their parents) as digital immigrants (Rushkoff, 1994; Prensky 2001).

Information Flow: The Teachers

The analysis detected an interesting difference between the two programs in the manner of information flow between the teachers and other actants. In the national program, teachers transmit messages which express feelings of exploitation, complaints of lack of infrastructure and of compensation (to Ministry of Education supervisors and to school principals), of embarrassment (to students), and of helplessness (to supervisors). In the municipal program we observe a flow of messages expressing a sense of accomplishment, of competence and of knowledge acquisition (to supervisors, parents, students and principals).

Technological Actants: Teachers and the Computer

One of the important strengths of ANT is that it places humans and technologies in the same plane, and explores the interrelations between them. An interesting relationship that was revealed in the comparison of the national and the municipal programs is a significant difference

in how the computer is perceived by the teachers in the two programs. In the municipal program we observe feelings of ownership, pride and competence expressed by the teachers towards their laptop computers, while in the national program we see lack of confidence, trepidation, and antagonism of the teachers towards the computer and other technologies.

Missing Relationships: Assessment and Evaluation Measures
The analysis detected an apparently important lack of evidence for assessment and evaluation measures in the national program. In the municipal program we see relationships of measurement and assessment between the steering committee and various actants such as teachers, principles and students. In contrast, despite the significant amount of documents which describe operational and quantitative goals for the national program, we do not find evidence for processes that evaluate the achievement of these goals.
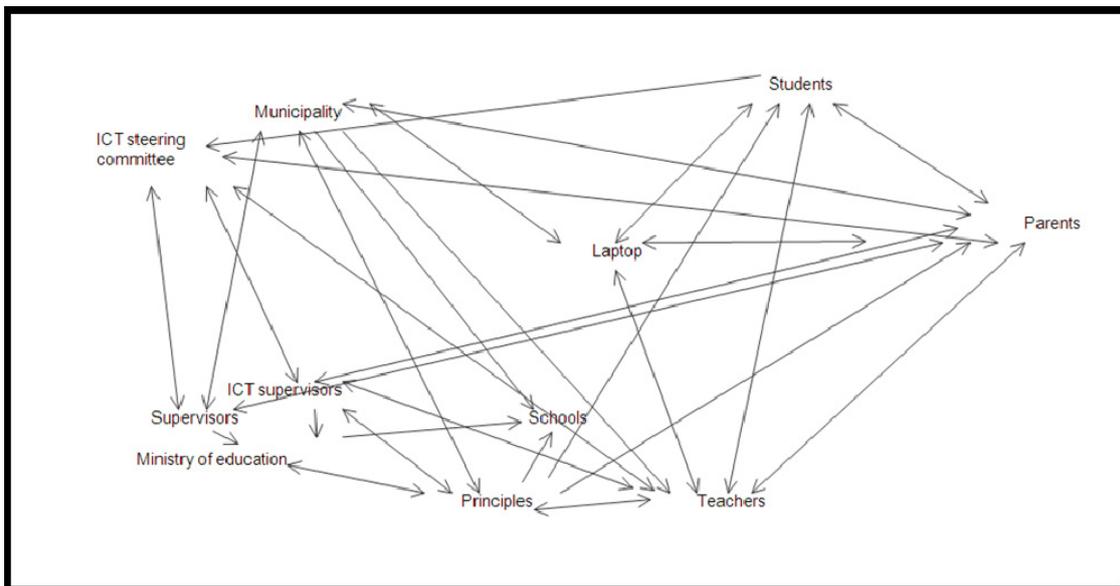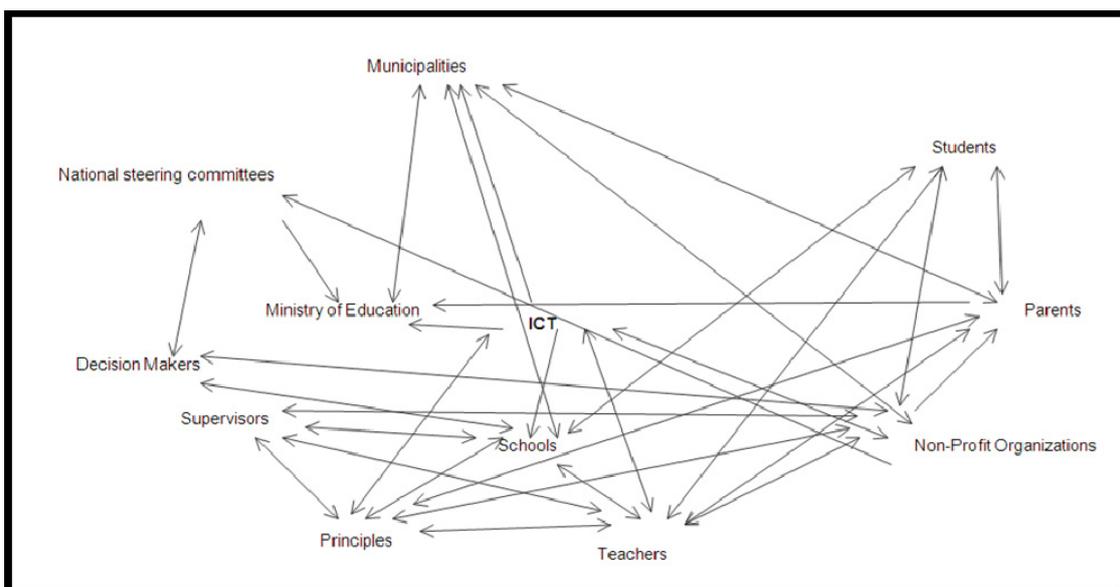

Figure 1. Municipal ICT Program Network

Figure 2. National ICT Program Network

Limitations of the Study, and Further Research

Before moving to the conclusions, it is vital to point out some of the important limitations of these findings. Since we are aware of no ANT studies of ICT integration programs in educational systems, this pilot study is, necessarily, limited in several aspects. Firstly, the documents which were analyzed were not collected randomly, and thus cannot be expected to comprise a representative sample of program related documents. This might introduce unexpected bias into the results. We believe that these findings warrant a larger scale collection of documents, as well as active documentation efforts. Secondly, the study is based on a comparison of very different programs, both in scope and in duration. Despite the possible criticism that we are comparing "apples to oranges", it is exactly the differences between the two programs that allowed us to compare the two networks and identify differences. Many of the differences were not interesting or valuable, and were ignored, but other differences that surfaced appear to be significant, and pointed to elements in the national program that could be the source of the significant discourse about failure in that program. It is important to point out that these elements now need to be explored in the field, so as to ascertain their role in constructing the discourse about failure. Lastly, readers might question the importance of exploring the *discourse* on failure of a specific program, versus the exploration of the actual failure. The skepticism about the importance of discourse cannot be addressed in this short format. Nevertheless, this perception is at the heart of the social constructivist approach (Potter, 1996).

Conclusion

An ANT analysis of the network of relationships related to the talk about failure (and about success) in two ICT integration programs in the Israeli K-12 educational system revealed interesting differences between the two networks. The results of the study are promising, and have succeeded in yielding novel insights which might not have been gained through the methods traditionally used in analyzing these processes. The analysis highlights actant identity, actant roles, information flow in the network, technological actants, and relationships as possible factors that could explain the predominance of talk on program failure in the national ICT integration program.

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