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The Humanistic Side of Eco-Industrial Parks: Champions and the Role of Trust

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HEWES A. K. and Lyons D. I. (2008) The humanistic side of eco-industrial parks: champions and the role of trust, *Regional Studies*. Two leading advocates of eco-industrial parks (EIPs), Valdemar Christensen and Peter Lowitt, participated in a qualitative research study focused on their role in developing EIPs in Ukraine and Massachusetts, USA, respectively. Christensen formerly championed industrial symbiosis in Kalundborg, Denmark, and Lowitt shepherded the process at the Londonderry EIP in New Hampshire, USA. Based on the empirical data collected from the methods of ethnography and grounded theory, a systematic analysis of champion behaviour revealed emergent themes that champions of EIPs emphasize social relationships as opposed to technological connections. The repeating themes of trust and community embeddedness, proximity and the importance of the champion to the long-term viability of the project were highlighted. The foundation of the Champions' success was the ability to establish humanistic connections to advance the industrial ecology project.

Eco-industrial parks Champions Embeddedness Proximity Trust Social relationships

HEWES A. K. and LYONS D. I. (2008) 生态产业园的人文性：领袖及信任的作用，区域研究。两位倡导生态产业园的领导人物 Valdemar Christensen 以及 Peter Lowitt 参与了一项定性研究，以考察他们在推动美国 Ukraine 以及马塞诸塞生态产业园发展中各自所起到的作用。Christensen 早前引领了丹麦 Kalundborg 地区的产业共生（建设），Lowitt 指导了美国新哈雷姆郡（New Hampshire）伦敦德里（Londonderry）产业园的建设。在以人文地理学及“平地”理论（Ground Theory）方法搜集的实践数据基础上，研究对领袖行为进行了系统性分析之后，发现生态产业园（EIPs）领袖人物更重在强调社会关系而非技术性关联。其他重复出现的主题，如信任、社区嵌入、相似性以及领袖人物对于项目长期适用性的重要意义在研究中也得到强调。领袖成功的基础在于其建立人际联系以升级产业生态项目的能力。

生态产业园 领袖 嵌入性 相似性 信任 社会关系

HEWES A. K. et LYONS D. I. (2008) L'aspect humaniste des zones eco-industrielles: leurs défenseurs et le rôle de la confiance, *Regional Studies*. Deux des principaux avocats des Zones Eco-industrielles, Vlademar Christensen et Peter Lowitt, ont participé à une étude qualitative centrée sur leur rôle dans le développement de zones éco-industrielles, respectivement en Ukraine et dans le Massachusetts, aux Etats-Unis. Christensen a autrefois défendu la symbiose industrielle à Kalundborg, au Danemark, et Lowitt a conduit ce processus dans la zone éco-industrielle de Londonderry dans le New Hampshire, aux Etats-Unis. Sur la base des données empiriques recueillies selon les méthodes de l'ethnographie et de la théorie ancrée, une analyse systématique du comportement des partisans de ces zones a mis en évidence les thèmes émergents selon lesquels les défenseurs des zones éco-industrielles mettent l'accent sur les relations sociales par opposition aux rapports technologiques. Les thèmes qui se répètent de la confiance et de l'encastrement communautaire, de la proximité et de l'importance du partisan de la zone pour la viabilité du projet à long terme ont été mis en relief. Le succès de ces Défenseurs des zones éco-industrielles s'est fondé sur la capacité à établir des rapports humanistes pour faire avancer le projet d'une écologie industrielle.

Zones éco-industrielles Défenseurs Encastrement Proximité Confiance Relations sociales

HEWES A. K. und LYONS D. I. (2008) Die humanistische Seite von Öko-Industrieparks: Fürsprecher und die Rolle des Vertrauens, *Regional Studies*. Zwei führende Fürsprecher von Öko-Industrieparks, Valdemar Christensen und Peter Lowitt, nahmen an einer qualitativen Forschungsstudie teil, in deren Mittelpunkt ihre Rolle bei der Entwicklung von Öko-Industrieparks in der Ukraine bzw. in Massachusetts (USA) stand. Christensen war zuvor an einem industriellen Symbioseprojekt in Kalundborg (Dänemark) beteiligt, während Lowitt die Entwicklung des Öko-Industrieparks von Londonderry in New Hampshire (USA) beaufsichtigte. Ausgehend von den empirischen Daten, die mit Methoden der Ethnografie und fundierten Theorie erfasst wurden, wurden bei einer systematischen Analyse des Verhaltens der Befürworter die Themen deutlich, dass die Fürsprecher stärker die gesellschaftlichen Beziehungen betonen als die technologischen Verknüpfungen. Die sich wiederholenden Themen

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des Vertrauens und der Einbettung in die Gemeinschaft sowie der Nähe und der Wichtigkeit des Befürworters für die langfristige Durchführbarkeit des Projekts wurden hervorgehoben. Grundlage für den Erfolg der Fürsprecher war die Fähigkeit, humanistische Verknüpfungen zu schaffen, um das industrielle Ökologieprojekt voranzubringen.

Öko-Industrieparks Fürsprecher Eingebettetheit Nähe Vertrauen Gesellschaftsbeziehungen

HEWES A. K. y LYONS D. I. (2008) El aspecto humanístico de los parques ecoindustriales: defensores y el rol de la confianza, *Regional Studies*. Dos líderes defensores de los parques ecoindustriales, Valdemar Christensen y Peter Lowitt, participaron en un estudio de investigación cualitativo cuyo objetivo principal era examinar su papel a la hora de desarrollar los parques ecoindustriales en Ucrania y Massachussets, EE.UU. respectivamente. Christensen propugnó antiguamente la simbiosis industrial en Kalundborg, Dinamarca y Lowitt dirigió el proceso en el parque ecoindustrial de Londonderry en New Hampshire, EE.UU. A partir de datos empíricos recogidos a partir de los métodos de etnografía y teoría fundamentada, un análisis sistemático de la conducta defensora dejó patente como tema emergente que los defensores de los parques ecoindustriales hacen hincapié en la importancia de las relaciones sociales y no en las conexiones tecnológicas. Predominaron los temas frecuentes de confianza y arraigamiento en la comunidad, proximidad y la importancia de los defensores para obtener una viabilidad del proyecto a largo plazo. La base del éxito de los defensores fue su capacidad de establecer conexiones humanísticas para avanzar en el proyecto de la ecología industrial.

Parques ecoindustriales Defensores Arraigamiento Proximidad Confianza Relaciones Sociales

JEL classifications: A14, B5, D7

INTRODUCTION

Industrial ecology (IE) is emerging as an important strategy in the attempt to develop industrial and consumptions systems that are more environmentally benign. Although the principles of IE are gradually finding an audience among leaders in industry, academia and government agencies (O'ROUKE *et al.*, 1996; EHRENFELD, 2000, 2002; REJESKI, 1997; GILLE, 2000; SCHLOSBERG and DRYZEK, 2002; KAUTTO and MELANEN, 2004; OPOKU, 2004; LIFSET, 2005; COHEN and HOWARD, 2005), it is more a set of related ideas than a unified theory. While IE related studies run the gamut from firm level studies focusing on green design and green accounting to the study of global material flows (CHERTOW, 2004), in essence, IE argues that industrial activity needs to be transformed into a more integrated model: an industrial ecosystem. Here raw material extraction and waste generation is minimized since waste serves as the raw material for another process (FROSCH and GALLOPOULOS, 1992; EHRENFELD and GERTLER, 1997; ESTY and PORTER, 1998).

A central element of industrial ecology is the concept of closed loop systems where energy and waste materials are continuously recycled between geographically proximate firms – a process defined as industrial symbiosis (IS). Within the IE literature there is a tug of war between two basic strategies for IS: engineered systems and self-organizing systems (COHEN-ROSENTHAL, 1996, 2000; CÔTÉ and COHEN-ROSENTHAL, 1998; KORHONEN, 2002). Engineered systems are essentially 'pipe-to-pipe' strategies that integrate innovative engineering solutions as the basis for a more sustainable industrial system (LOWE and EVANS, 1995). Here the focus is on the technological questions of finding the correct matching of material supply and demand and the proper place for any wastes that are left over. The essential requirements are chemical and engineering know-how, proper technologies for aggregation and separation, and market based incentives for industrial ecology connections (ALLEN and BEHAMANESH, 1994; SOCOLOW *et al.*, 1994; GRAEDEL and ALLENBY, 1995).

The self-organizing approach focuses on the creation of bilateral, profitable and environmentally sound linkages between local networks of firms and the surrounding community in the form of eco-industrial parks (EIPs). While the term 'eco-industrial park' is used in the industrial ecology literature to describe inter-firm connections, the exchanges do not necessarily exist within the confines of a physical park (SCHWARZ and STEININGER, 1997; WALLNER, 1999; ANDREWS, 2001; STERR and OTT, 2004). Rather, the key element is collaboration and the synergistic possibilities offered by geographic proximity (CHERTOW, 2000). Stressing the need for complex, local networks for sustained economic and environmental success an EIP presents models of networks of businesses that cooperate with each other and the local community to efficiently share resources leading to economic gains and improvements in environmental quality. Here the focus is on developing the necessary social connections in order to create effective industrial ecology linkages (EHRENFELD, 2000; BOONS and BERENDS, 2001; KORHONEN, 2001; ISENMANN, 2002; LYONS, 2005), with the assumption that human ingenuity will solve any emerging technological issues. As the late COHEN-ROSENTHAL (2000) argued:

> It is not in the technologies that the answer lies but in the ways humans make choices, their willingness to seek out new connections, to invent new combinations, to explore the possibilities of the world around us. *Technology*

> *application is a function of human intent* [italics added]. Hence, technological determinism or optimism alone is insufficient.
>
> (p. 250)

In developing industrial symbiosis linkages two case studies illustrate the significance of establishing humanistic connections throughout the IS stages. The case studies also represent two quite different social, economic and political systems. Specifically, the strategies used by two leading advocates (or 'champions') of industrial symbiosis, Peter Lowitt and Valdemar Christensen, and their role in developing EIPs in Devens, Massachusetts and the towns of Komsomolske and Cherkassey in the Ukraine, respectively, are described. In both cases the champions begun by focusing on developing relationships of trust between the EIP actors. The paper examines three questions in relation to these strategies. First, it examines how the champions developed social relationships within the EIP group and between the EIP group and the champion to develop interactions based on trust. Second, it examines the issue of proximity and the importance of the champion being personally located in the community. Finally, the paper examines the question of the longer term viability of eco-industrial parks once the champion has departed.

Both champions (Lowitt and Christensen) were selected on the basis of their reputations as leading advocates of EIPs. Lowitt was a principal player in the development of the Londonderry (New Hampshire) Eco-Industrial Park (LEIP) between 1993 and 1999. LEIP was modelled on the celebrated Kalundborg industrial symbiosis model (EHRENFELD and CHERTOW, 2002). As the Town Planner he was the Director of planning and economic development, Lowitt advanced the idea of an EIP and worked with private sector partners to establish environmental codes and covenants for the LEIP and to attract an anchor business, in this case, a power plant, known as Granite Ridge. Lowitt left the LEIP in 1999 for a position at the former Military base, Fort Devens, where he initiated a corporate collaboration and environmental performance programme called EcoStar (HEWES, 2005). In 2003, he recently spearheaded the Eco-Industrial Development Council (EIDC), with other EIP practitioners in Canada and the USA, and he has spoken about LEIP and the Deven's EcoStar project at numerous conferences.

Valdemar Christensen, who holds a PhD in mechanical engineering with emphasis in technical energy combustion, was formerly the Facility Manager at the Asnæs Power Plant, the anchor business of the industrial symbiosis in Kalundborg. With his wife, Inge, he coined the term 'industrial symbiosis' in 1989, which they define as 'the collaboration among different industries for mutual economic and environmental benefit' (HEWES, 2005). Although he retired in 2000 after 15 years at Asnæs, he and his wife spent the following year in Ukraine working on energy projects. When he returned to Denmark he served on the Town Council of Kalundborg from 2001 to 2005 as director of the city's Technical Environmental Department (Kalundborg Kommune Teknisk Forvaltning) and served as the President of the Environmental Club, an organization credited with many of the innovative waste exchanges established in Kalundborg over the 1990s (SYMBIOSIS INSTITUTE, 2001). He is a passionate supporter of sustainable development and speaks extensively on the Kalundborg EIP, most recently in China in 2005 and Switzerland in 2007.

LITERATURE REVIEW

An extensive literature in economics, economic sociology, organizational theory and economic geography describes how the social context of network connections, and particularly relationships of trust positively impact the innovation, performance and competitiveness of firms and industries (e.g. GRANOVETTER, 1985; SABEL and ZEITLIN, 1985; SCOTT, 1986; BECATTINI, 1990; PORTER, 1990; STORPER, 1995; DICKEN and MALMBURG, 2001; ETTLINGER, 2003). Such local connectedness encompasses formal and informal interactions between producers, suppliers, distributors and customers, subcontracting relationships and strategic alliances between groups of firms (HARRISON, 1992; HARRISON *et al.*, 1996; PARK, 1996; GRABHER, 1997; HAGEDOORN, 1997) as well as local and state government, trade associations, universities and other public institutions (PARK and MARKUSEN, 1995; GLASMEIER, 1999).

Central to the notion of connectedness is the concept of 'embeddedness'. Embeddedness is concerned with the role of personal relations and networks of such relations, rather than with generalized economic morality (ARROW, 1974), in generating trust and discouraging malfeasance during formal and informal inter- and intra-firm economic interaction (GRANOVETTER, 1985; GRABHER, 1997). Embeddedness results from trust that develops from earlier positive experiences in which interaction led to mutually profitable growth (HARRISON, 1992; GRABHER, 1997). Over time, through continual contracting and recontracting, formal and informal deal-making and support during times of economic stress and uncertainty, this trust deepens and firms develop strong preferences to transact with firms or individuals of known reputation (GRANOVETTER, 1985; FUELLHART, 1999). District competitiveness is sustained as firms continue to be economic rivals by engaging in continuous innovation and competing in terms of quality and technique, rather than price (LAZONICK, 1993).

GRANOVETTER's (1985) original argument did not include a spatial component, although proximity and, more broadly, place considerations are consistent with

his formulation (LYONS, 2005). If trust is built through the repeated interactions of actors which result in positive outcomes, such interaction is likely to be facilitated by personal contact, and that contact is, in turn, enhanced by geographical proximity (HARRISON, 1992; FLORIDA, 1998; GLASMEIER, 1999; KIRAT and LUNG, 1999). Similarly, if proximity enhances opportunities for face-to-face contact, and this facilitates exchanges of knowledge and know-how in a local economy, embeddedness is likely to emerge from a level of trust in places where significant concentrations of firms exist and in turn, cooperate. In addition, proximity may reduce the costs of negotiating and monitoring contracts and, by increasing the likelihood of familiarity, reduce the incidence of opportunistic behaviour by suppliers, customers and even competitors (WILLIAMSON, 1996).

The importance of embeddedness and trust has also been highlighted in the development of the industrial symbiosis connections of Eco-Industrial Parks. MIRATA (2004) reports that a history of limited interaction between the petro-chemical and chemical firms in Humber, UK, led to a persistent unwillingness of the firms to cooperate to solve a series of technical difficulties that emerged as efforts to develop industrial symbiosis were undertaken. In contrast, firms in the West Midlands, UK region had a history of inter-firm collaboration thus making new IS network linkages easier. Similarly, JACOBSEN and ANDERBERG (2001) suggest that the difficulties experienced at the Åvedore Holme project (south of Copenhagen) lay in the lack of personal trusting relationships. The project was championed by COWI, an outside consulting firm that failed to become invested with the local community and local businesses. As a result of not being embedded in the local community, the Åvedore Holme experiment failed.

Despite the elaborate theoretical description of trust and embeddedness some authors (e.g. OINAS, 2002; GERTLER, 2003) question the abstract nature of many trust-related network studies and argue for more in-depth work into the specific relationship between trust and innovation and performance. Similarly, MURPHY (2006) argues that the literature lacks a clear and consistent conceptual framework addressing the processes or mechanisms through which trust (or distrust) emerges in social or economic context(s). For example, differences in the types of interaction described above for the Humber and West Midlands firms was due in large part to the governance structures of the firms in both regions. The Humber firms were generally regional branches of larger firms whose Headquarters and, thus, their decision-making power, were located elsewhere making cooperation more difficult. In contrast, the firms in the West Midlands were headquartered in the region and their local programmes were represented by managers with sufficient powers to make local decisions (MIRATA, 2004). MURPHY (2006) argues that relational proximity has been exaggerated in the literature and suggests that physical proximity is central for learning and innovation processes. This is supported by the evidence cited in relation to the Åvedore Holme project where the COWI consulting firm attempted to manage the project without locating personnel within the community (JACOBSEN and ANDERBERG, 2001). This discussion lends support to the MACHINNON *et al.* (2002) call for a shift in research methodology and a focus on tracing network construction via comparative, ethnographic research to identify more clearly the threads that bind and link together particular clusters and nodes of activity (BUNNELL and COE, 2001).

CASE STUDY SITES

Devens

The Devens, Massachusetts, experiment emerged as part of the redevelopment strategy for a 4400-acre military base and superfund site closed during the US Military Base Realignment and Closure (BRAC) programme initiated at the end of the Cold War. The Devens Enterprise Commission (DEC) was established by the Commonwealth of Massachusetts to develop a redevelopment plan for the base, which included a mandate for environmental stewardship and sustainable economic development. The by-laws that were developed in the final 1994 re-use land plan employed a variety of zoning, density and signage requirements, floodplain and wetland protection provisions, and historic preservation to incorporate elements of sustainable development, including industrial ecology strategies.

In 1999, Peter Lowitt, accepted the position of Director and Land Use Administrator as part of DEC and immediately launched an initiative to encourage inter-firm cooperation, known as the 'EcoStar' programme. EcoStar is an environmental achievement and branding programme developed by Lowitt and a steering committee of citizens, business representatives, government officials and environmental advocates. EcoStar provides technical assistance and recognition to local businesses and organizations that become 'achievers' in the implementation of 15 out of a possible 25 environmental performance standards with emphasis on pollution prevention standards. The standards include strategies for waste and toxic use reduction, water and energy efficiency, recycling, purchasing of environmentally preferable products, ecological landscaping and an attempt to establish waste and by-product exchanges among the firms. Businesses located at Devens and in the surrounding towns of Ayer, Harvard and Shirley are invited to join the EcoStar programme. As of 8 December 2006, 22 businesses have joined EcoStar (D. Neely, personal communication, 8 December 2006).

A modest number of by-product exchanges exist within the park, including waste oil used in a greenhouse's heating system and the exchange of wood pallets between two companies (D. Neely, personal communication, 8 December 2006). In addition, a new solid waste master plan has been developed that will provide collective waste disposal and more by-product exchange facilitation, re-use/recycling services to all firms and residents in the park. The waste management service is offered at a flat rate as opposed to a pay-by-weight basis and a collection centre for recycling paper, glass, plastic and clothing has been established on-site (D. Neely, personal communication, 8 December 2006). Plans to develop an e-service material exchange to notify EcoStar members about reusable materials such as old office furniture and surplus materials through a new programme called 'EcoStar Exchange' are also underway (D. Neely, personal communication, 8 December 2006).

Ukraine

The two sites in Ukraine emerged from the Danish government's request for proposals (RFP) to aid with Ukraine's transition from a command to a market economy. Valdemar Christensen proposed two industrial symbiosis projects (modelled to some extent on his Kalundborg experiences), in the towns Komsomolske and Cherkassey. His goals were to establish project teams at two sites in the Ukraine that represent people from industry, local authorities and local non-governmental organizations (NGOs) who were engaged and interested in creating IE projects; and to establish some IE projects that could be used as examples of the possibilities for future EIP activities. He was particularly interested in finding effective and financially attractive ways to re-utilize surplus energy, waste energy and waste materials in both towns.

Komsomolske is a small (population $<20\,000$) factory town in the Donetsk Province (Oblast) of Ukraine, situated by the Zmievskaya thermal power plant (ZTPP). The primary IE proposal was to develop a plastic recycling operation adjacent to the ZTPP. The recycling plant uses plastic bags collected in town as raw material to manufacture plastic tubes of varying diameters used in local road construction and agricultural fields. This project is currently operating successfully with strong support from the local government and citizens.

A second project involved the establishment of a dairy in the town to take advantage of excess heat generated by the ZTPP. However, while the district heating pipes are available, they have not been connected for use by the dairy (or nearby greenhouses and fish farms). Feasibility studies were conducted by the Institute of Practical Machinery (IPM), an elite scientific organization located in Kharkiv hired by Christensen, to evaluate the use of ash and slag generated from the ZTPP to produce pedestrian plates – i.e. concrete sidewalks. More recent proposals focus on cement production and the redirection of excess ZTPP heat to greenhouses and fish farms are underway.

Cherkassey, a much larger city south of Kiev with a population of 250 000, has a technical university and a large combined heating power plant (CHP). The original proposal involved establishing a project team to identify potential industrial symbiosis pilot projects and the Technical University of Cherkassey took the lead. One proposal focused on utilizing zinc from the waste of a textile plant that produces artificial silk. The waste contains zinc sulphate ($ZnSO_4$) and a project to extract zinc from the waste is in development with the completion of a prefeasibility study. The Cherkassey team initiated several community projects that were based on Local Agenda 21 principles. A 'Clean City Programme' included the establishment of a recycling programme and the development of a Material Recovery Facility (MRF) to sort and separate the recyclables (CHRISTENSEN, 2003). Other grassroots projects led by the University and local non-governmental organizations (NGOs) concentrated on tree plantings projects and educational seminars.

METHODS

The empirical investigation employed an ethnographic approach rooted in grounded theory to develop an understanding of 'what IE champions do' and 'who IE champions are' (GLASER and STRAUSS, 1967) through immersion (EMERSON, 1983) and description (WOLCOTT, 1994) as the principal observational methods. The ethnographic fieldwork conducted in 2003 in the USA and in Europe, allowed direct access to the champions' world and an on-going dialogue (GLASER, 1978) to develop an understanding of the role of champions as they develop EIPs. Over the course of two field excursions (March–April 2003 and September–October 2003) to Denmark and Ukraine respectively, and an internship at the Devens Enterprise Commission (February–September 2003 except during March and April 2003), each subject was interviewed numerous times. One of the authors (Hewes) focused the interviews on how the champions approach developing EIP. Examples of interview questions in this research include: What strategies or skills do you call on to make the connections necessary for an EIP? How do you do it? What strategies have you developed to overcome barriers as you implement your second EIP? What tools have you drawn on from your first EIP experience? What would you do differently? Many questions evolved organically as the interview progressed while other questions stemmed from earlier discussions that led to follow-up questions. In addition, the research subjects were also observed throughout their daily routines, which generated

further opportunities for dialogues and informal conversations (LINCOLN and GUBA, 1985; HAMMERSLEY and ATKINSON, 1995).

An additional 30 'triangulated' interviews were conducted with project team members, colleagues, employees, friends and family of the subjects to validate their answers as well as the observer's perceptions. Triangulation is a verification strategy by which inferences drawn from one set of data sources are challenged by data collection from other participants. Triangulation also offers new avenues of discovery by uncovering new areas for inquiry that lead to new insights. For example, in several interviews conducted with associates of Christensen from the Municipality offices in Kalundborg, respondents described him as 'up in the clouds'.

> Valdemar's ideas are seen as 'up in the air' not grounded in reality by local people and that he has a difficult time articulating his theories in layman terms. Although Valdemar is a visionary, his lofty ideas do not always translate to the common people of Kalundborg.
>
> (VIGGO, Kalundborg Business Partner, personal communication, 1 October 2003)

> Valdemar has lofty ideas, he is up in the clouds and many people can't follow him.
>
> (HENRIK, Kalundborg Business Partner, personal communication, 2 October 2003)

Christensen, himself admitted that 'Inge [his wife] takes care of the details in his life'. These comments led to follow-up triangulated interviews with Christensen, family members and colleagues. Deeper reflection by working with the data revealed that a person who is described as 'up in the clouds' and who admits to not being detail oriented is consistent with an abstract thinker, who is not as concerned with the details but more preoccupied with large concepts and can be described as a 'visionary'. This interpretation is echoed by the former Director of the Symbiosis Institute in Kalundborg, 'Valdemar has such a strong technical background, and yet he is such a visionary' (N. Jacobsen, personal communication, 3 October 2003).

The value of an ethnographic approach based on grounded theory is that it provides a rich descriptive data set about a job or activity and how that job plays out on a daily basis (WOLCOTT, 1984). Unlike more standard empirical approaches an essential tenet of grounded theory is to approach the research process without a preconceived hypothesis and to be open to the data by suspending judgement as explanations emerge. The research hypothesis – the 'grounded theory' – emerges out of data analysis and subsequent data collection is guided strategically by the emergent theory (HAMMERSLEY and ATKINSON, 1995).

Such an inductive approach begins with an examination of the data to see what kinds of items or concepts emerge. Items consist of distinct and specific units of analysis that are then coded from the triangulated interviews and observational field notes (LECOMPTE and SCHENSUL, 1999). Codes or themes, represented by names or symbols, are assigned to similar items or ideas related to the research question and classified as recurring, rare, apparently crucial, or absent (CHARMAZ, 1983; STRAUSS and CORBIN, 1998; LECOMPTE and SCHENSUL, 1999). Data are further classified by 'chunking' together specific codes or themes into broader categories of similar characteristics (GLASER and STRAUSS, 1967). At all stages, it is important to keep data parsimony, to keep working with data so it concisely represents the premise or patterns. Plausible conceptual connections begin to take shape in the form of analytic notes and memoranda (GLASER and STRAUSS, 1967; DEY, 1999). However, 'the truly analytical moments will occur during brief bursts of insight or pattern recognition' according to WOLCOTT (1994, p. 30). Discovering the relationships between items transforms the data into categories that are then connected into patterns (AGAR, 1983; LECOMPTE and SCHENSUL, 1999).

After connecting and integrating the categories, the concepts are combined into a meaningful story (DEY, 1999). The process works by constantly deconstructing data from transcripts, journal memos and reconstructing the codes into similar and dissimilar patterns (WEBLER and TULER, 2000). For example, the data fell into two primary categories based on the champions' 'character' and 'strategies', referred to as 'who they are' and 'what they do', respectively. The categories represent observed actions used by the champions, such as, 'bring people together', 'get local buy-in', 'caring' and 'trust' that result in the strategy of 'developing social relationships'. Fig. 1 illustrates the connection of these codes.

Data analysis of the extensive interview dialogues yielded several codes as represented in the above diagram; however, this paper focuses on the role of 'trust' and 'embeddedness', which contributes to the emergent grounded theory of 'developing social relationships' by the champions. The following results focus on these themes.

RESULTS

Social relationships and trust

Lowitt and Christensen both focus substantial energy in developing social relationships. Based on this research 'social relationships' refers to individual relationships created between people on a one-on-one personal level and the ability to partner and gain investment in a community and garner local support by leveraging those relationships. Themes related to developing social relationships such as 'caring for associates', 'building trust', 'bringing people together', 'developing local support', 'identifying key people' and 'motivating buy-in' emerged frequently throughout the interview process. However, the precise mechanisms and the

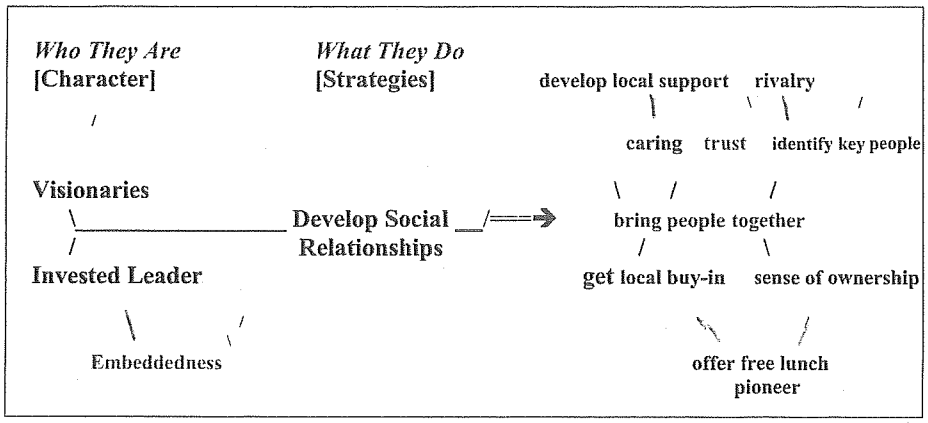

Fig. 1. Grounded theory codes – descriptions of strategies/characteristics employed by EIP champions

degree of success used by each champion varied considerably.

Christensen's approach is very open and welcoming and he purposively involves himself in the lives of his colleagues by getting to know their histories and personal stories. As he puts it, 'it's a kind of infiltration into the local society'. Such infiltration is not trivial, however. When he first arrived in the Ukraine, he followed a top-down approach by attempting to bring in high ranking government officials to his project, but he found that the government officials were driven more by self-gratification than by the desire to develop a successful EIP project. As a result, he read the context of the political landscape and altered his strategy by developing local support through a bottom-up approach. He describes being brought into the homes of the Ukrainians and slowly developing friendships and thus, trust. Even after changing strategies, penetrating Ukrainian society continued to be difficult. When he first arrived in Ukraine he found that:

> it was extremely difficult to establish relationships to the Ukrainians. Some were looking at me as a spy and others tried to push me for getting money. After approximately half-year some of the Ukrainians started to accept me. Then they were visiting Denmark on a study tour I organized in Kalundborg and they could see me in my daily life and they got a much better understanding of me as a person and of my identity. Then I have used these persons for introduction of me in my new projects in Ukraine and the number of persons I know is still growing. Today it includes the mayor in the towns Cherkassey and Komsomolske and the mayor in Kharkiv (1 million pop.). It also includes professors at the university in Kharkiv and Cherkassey. In Kiev, I worked with an office that had developed a relationship with the Danish embassy and from there I have established other relationships through friends and relatives who have skills I can use on my project. My conclusion is that [if] there is resistance from the beginning then [only by] hard work and slowly you can increase the number of persons. It takes more than one year! During this year you must demonstrate that you want to learn to speak their language. ... Today I am invited to a lot of private parties when I am in Ukraine.
>
> (V. Christensen, personal communication, 11 December 2002)

Key elements highlighted by this quote and the broader themes highlighted above are the issues of trust and time. Just as is the case with firms that contract with each other, it is the positive experience of interacting over time that achieves trust between two actors and leads to the potential for more complex embedded networks over time. Overlapping the theme of 'trust' is the local network of connections that emerged from the personal bonds that Christensen was able to nurture. As a foreigner, Christensen knew that he needed to leverage local knowledge to connect to existing and to develop his own, locally embedded networks. This gave him credibility as well as nurturing more contacts as he developed his IS network. 'They know exactly where to go in different situations and [which] people to go to locally. They can do what I couldn't do by myself. But you can use them, their local knowledge. Trust. So this trust has led to the networks I use' (V. Christensen, personal communication, 7 April 2003).

The notion of developing support for a project from within the local community was important to Christensen in Ukraine, as well as in his earlier work in Denmark. He recognized the value of community relationships and their connection to a future goal. 'With social relationships, we are empowering each other. Locally you have to make social relationships with the people in the local companies, and they need to be part of the future' (V. Christensen, personal communication, 7 April 2003). In this way, he was able to penetrate both the local barriers of business and culture and differences in business attitudes across cultures (HEWES, 2005) to develop his EIP projects.

Lowitt also believes that the construction of social relationships is key to the development of EIPs. In

Londonderry and Devens, his approach is more stylized and relies on the standard planning strategy of a steering committee as the starting point in his effort to develop local trust and support.

> Well, social relationships are really key to the development of EIPs because when you get right down to it we try to mandate cooperation. And you can't do that prima facie but can set up situations where you put people in close contact with each other such as the luncheons that you participated in. And you build trust that way and you build informal relationships.
>
> (P. Lowitt, personal communication, 28 May 2003)

Lowitt began the Devens EIP by targeting the top managers from local companies to create a 'steering committee' that meets once a month over lunch to learn about his EcoStar programme concept. While he describes this approach 'as a tried and true planning participation process' he also believes that the lunches (which are free) are effective tools to 'bring people together' from their busy schedules to participate in monthly steering committee meetings at Devens (P. Lowitt, personal communication, 28 May 2003). Overtime, the formal interactions of being a member of the steering committee generate informal relationships from 'folks meeting and talking with each other and sharing what is working for them' (P. Lowitt, personal communication, 24 September 2003). He describes the connection in which individuals who met in the EcoStar setting went the next step to seek 'intangible things like the way two business members got together and toured each other's plants' (P. Lowitt, personal communication, 24 September 2003). The tours led to an agreement to purchase personal protective equipment collaboratively. The steering committee introduced people to each other and as a result trust emerged between business associates.

As was the case with Christensen, Lowitt is central to the development of this trust and the associated social relationships. One of the Steering Committee members described him as 'the person bridging the gap here ... [and] the lynch pin that has everybody working together' (Graham, Devens Steering Committee Member, personal communication, 6 March 2004). While Lowitt's strategy may be more formal it is not confined to the interaction originating within the steering committee. When asked if investing in the people beyond the workplace made a difference, Lowitt replied:

> I think that just underscores the need for multiple levels of relationships – social as well as work relationships. To strengthen the ties within a project. For example, I am having Martha go and talk to Rotary tomorrow night about what it is like to live and work at Devens. Those types of things I think are really important for stronger relationships and networks among colleagues.
>
> (P. Lowitt, personal communication, 24 September 2003)

Trust developed from establishing individual social relationships and was embedded within the construction of the social networks that both champions developed. Thus, a key finding is that the champions develop social relationships by establishing social systems that start with the code 'bringing people together'.

Both strategies contain weaknesses. While Christensen's strength is his ability to get personally involved with the people he interacts with, his evaluation of people, is by default, personal also. He feels that if you trust someone then he is willing to make the investment of his time and personality in your project. According to Christensen:

> In view as I did with Vladimir, if you are investing your personality, in cooperation, trust of course is very important. If you feel that you can't trust someone then you don't want to invest your personality in the cooperation. And I found with Vladimir that he really adored me. He wanted me to succeed in my job. And he gave very much support in the Ukraine and we developed a very good relationship. And when we meet we kiss the Russian way here and there. You will see it, you have seen it. It means that I accept you Vladimir and I accept you Valdemar. I do the same with [name withheld]. But more to be polite. But I do it with Vladimir >snap< because I mean it.
>
> (V. Christensen, personal communication, 30 September 2003)

Without a personal bond between him and his network colleagues, he is not willing to invest the time necessary to develop the social network. In the case of Lowitt, the weakness of the steering committee strategy is that the focus on developing social networks as opposed to the close personal relationship strategy of Christensen is that members may not feel comfortable expressing their opinions. The collective group approach creates an impersonal relationship among the members. This is evidenced by comments from several interviewees at Devens where steering committee members did not know the names of their fellow steering committee members or the hired facilitator's name. The lack of knowledge about each member's name within a small group that has met regularly for over three years, serves to underscore the differences that can emerge when developing social relationships.

Trust and proximity

A second dimension to the relationships of trust that both champions develop relates to proximity. While Christensen worked in the Ukraine the projects ran relatively smoothly. However, when he attempted to delegate from Denmark to Ukraine for those occasions when he was not physically located in Ukraine the network began to break down. He had delegated to a trusted associate in Kiev to keep him informed of activities at the Cherkassey field site – for this associate to be 'his eyes and ears' while he was out of the country.

However, the requested communication did not take place. Christensen described the failing, 'Since last spring many things have been carried through in Cherkassey. But we didn't know! He didn't tell us, he didn't inquire, he didn't feel a responsibility there.' Sounding disappointed, Valdemar continued, 'He wasn't engaged in the project, he didn't ask them anything' (V. Christensen, personal communication, 10 October 2003). Christensen admits to not paying attention to detail, as a result of his years as a manager at the Asnæs power plant and trusting that when he delegated a request that it would be carried out. Despite trusting local people and relying on a managerial style that had served him well for decades, Christensen learned the difficulties in managing a project when 'out of country' and 'out of culture'.

The drawback of not living and working in the community and relying on micromanaging from a distance, resulted in misinformation and misconceptions. Although he requested information, it was not forthcoming, which led Christensen to assume that his project team in Cherkassey had achieved very little. However, at the final seminar in Kiev in October 2003 it became clear that the Cherkassey team had actually achieved much through the drive and inspiration of two women. The women represented NGOs and they cultivated strong relationships within the local community and university and developed grassroots activities by linking Agenda 21 initiatives with industrial symbiosis. Christensen said he learned something from the Cherkassey team: 'And I learned something,' he said, pausing, 'that Agenda 21 could be used in Kalundborg or China, I am sure' (V. Christensen, personal communication, 10 October 2003).

Upon reflection after the Kiev conference, Christensen stated:

> I should have known that Ukraine is a society where you have to survive. And it is very much lead by the strong. In these proceedings it is the women. They are basically very strong – when you are really on the bottom of society. If I was to do anything differently – I would have been trusting them much more – it was my mistake. So yes, I would have done something else.
>
> (V. Christensen, personal communication, 10 October 2003)

The participants of the Devens EcoStar project are, by default proximate to the project. Through quarterly breakfast meetings at Mass Development and after hour meetings at the Chamber of Commerce, local support has grown for Lowitt's project, especially as people learn more about it. He shares information about EcoStar:

> We just talk about what is going on this quarter and it is very important to bring that conversation along. People get together and talk about things on one level and yet they are making relationships and connections that will work on the informal level.
>
> (P. Lowitt, personal communication, 24 September 2003)

Communicating with the community about EcoStar, Lowitt says, will promote local support when the 'community feels that their support of the programme is paying dividends to themselves in terms of having a greener industrial base' (P. Lowitt, personal communication, 24 September 2003). The businesses and Devens are connected to the surrounding community and on another level, the businesses are committed to EcoStar because they have bought into the programme. However, it is not clear how successful the programme would be if Lowitt left the project or when any champion departs.

TRUST BEYOND THE CHAMPION

A third central theme that emerged from the interviews related to the longer term role of trust in the success of an EIP after a champion departs. When asked this question Lowitt replied:

> The measure of a good program and a measure of its success is if you can walk away from your project, and it still functions and continues to flourish. Using that definition, I would say that Londonderry [LEIP] has been a success. And I think what it means is that you have created the connections and the institutional mechanisms to have a program function – to leave it functioning. Now at Devens, I think if I walked away right now without funding in place or anything like that, I don't think the program would go anywhere. Now a year from now, if we have an EcoStar staff person in place or such, then I think I could walk away, and the program would still be in place and functioning and would continue to do so.
>
> (P. Lowitt, personal communication, 28 May 2003)

The long-term potential of the Devens EIP and the continued importance of a champion is open to question. Deven's EcoStar is still in the planning stage but the project has a good chance to start, according to many of the participants.

> I think that in the long run it will be a success, or at least it could be a success. But are we going to be able to get there? And even when we get there, who is going to run it?
>
> (Sebastian, Devens Steering Committee Member)

> Has it met my expectations? Yeah, I think it has been as I thought. I think it has been a long journey. And I think at times difficult and yet – well I think we are doing good. And when I say 'good' I mean we are doing good things – not we are doing well, but we are doing good things.
>
> (Liam, Devens Steering Committee Member)

> I have a good connection with the program, I have a good feeling about it. I am positive about it in the sense that I believe it will work out even though it might be taking a bit longer than we would have liked. But I think it will get there.
>
> (Euan, Devens Steering Committee Member)

Lowitt continues to live nearby and work at Devens EcoStar and while the project is still evolving it did reach a landmark in February 2005, when it held its initial 'kick-off' event. The key-note speaker was Gary Hirshberg the founder of Stonyfield Yogurt and long time colleague of Lowitt.

However, the evolution of Lowitt's earlier project at the LEIP in New Hampshire suggests that without a champion the projects are relatively fragile. In 1998 private developers, Sustainable Design and Development (SDD), purchased the Londonderry Eco-Industrial Park and inherited the strict environmental codes and covenants designed to promote industrial ecology. In 1999 Lowitt left Londonderry for Devens and put in place a mechanism to be 'on call' to assist his replacement, the new Town Planner, André Garron, as well as the developers, SDD, in furthering the mission of LEIP. Garron, the new town planner commented:

> Peter [Lowitt] has been a tremendous help to me with regard to LEIP. I am learning as I go about the concepts of EIP and even more about LEIP. I've been able to move forward with the development aspect of the park. The marketing and promotion and also the potential interchange amongst the existing businesses are difficult to pin down.
>
> (A. Garron, personal communication, 27 May 2004)

However, Lowitt (perssonal communication, 20 May 2004) said, 'I had been called back to Londonderry a couple of times since leaving to chat with SDD and the Town, but haven't been involved recently and recognize that the committee structure we put into play has apparently collapsed as you suggest'.

While Lowitt's replacement was excited about the LEIP, his remit was far larger than simply managing the EIP (WASSERMAN, 2001). At the same time, SDD felt constrained by the environmental restrictions for the LEIP and fought to loosen the codes and covenants to develop the land as a traditional industrial park (IP). With the town occupied with other municipal duties and SDD fighting to remove the 'eco' in EIP, Stonyfield Yogurt and AES power company, represented by Nancy Hirshberg and Gwen Matthews, respectively, surfaced as champions (WASSERMAN, 2001). Nancy Hirshberg summed up her frustrations with SDD and their efforts to remove the environmental protocols of LEIP by commenting:

> There are a lot of opportunities and a lot of exciting things to be involved with, and I want to reduce our impact on the planet. And banging my head against the wall working on an eco-park was not a productive use of my time. Frankly what I really regret was that there was no formal dissolution of the group (the steering committee) – it just sort of fizzled out.
>
> (N. Hirshberg, personal communication, 20 May 2004)

According to Gwen Mathews of AES, 'The town took a hands-off approach to the LEIP. Although he had other priorities, he did participate at meetings, and he was informed and helpful.' She said, 'The idea of a champion fell away' (G. Matthews, personal communication 19 May 2004). As a result, there was no longer a leader to tout the vision of industrial ecology (WASSERMAN, 2001).

Once the town sold the LEIP to the developers the town took a less active role in the park and the vision of the LEIP changed with the new owners. 'I think the developers who took it over had lower expectations of environmental accomplishments – of what could have been achieved environmentally – than what the initial advisory board had hoped and worked towards' (N. Hirshberg, personal communication, 20 May 2004). Thus, the shift in vision may have contributed to the failings at Londonderry – the lack of new members at the park, the lack of social gatherings, the lack of the community stewardship board, the lack of requested annual reports and the sale of the anchor business, AES, in 2004.

A key ingredient of the continued operation of EIPs is that of invested participants. In the case of LEIP, the process seems to have stalled. Granite Ridge, while still operating, is again up for sale (AES sold it in 2004 to a bank consortium; the bank consortium is trying to sell it in 2007). SDD has struggled to locate new business partners to LEIP. The wastewater exchange is still occurring between Granite Ridge and the City of Manchester and the other LEIP resident, a heating company, in 2006 sold to another manufacturer who hopes to expand its operations (A. Garron, personal communication, 10 February 2007). However, the commitment of SDD toward expanding the vision of LEIP has been limited despite a stream of invested partners. What is evident is that goals may diverge from the original plan and this includes support by the primary local actors, in particular the businesses and municipalities.

An assessment of the challenges faced when a champion departs were explained by Professor Ray Côté, of Dalhousie University in Halifax, 'There is no question in my view that champions are critical, but the commitment must be quickly spread across a wider group. I am very much afraid that our efforts will die, unless I can start grooming others at the university and involving others in the municipality and business community' (R. Côté, personal communication, 11 October 2002). Côté has worked on fostering inter-firm partnerships among businesses located in the Burnside Industrial Park in Nova Scotia through the guidance of the University staffed, Eco-Efficiency Centre (EEC). He points to his efforts to champion a commission of industrial park (IP) businesses to adopt the Eco-Efficiency Centre, 'Creating a Burnside Business Commission which might have adopted the Centre failed earlier this winter' (R. Côté, personal communication 4 May 2004).

Côté may not consider himself an 'EIP champion' but he has inspired many other industrial ecologists, including Lowitt and EcoStar. Côté's projects at

Burnside include a voluntary programme called the 'Eco-Business Program', which asks businesses to set some objectives and targets for their productions and an Awards Breakfast to recognize companies that meet their objectives and targets. 'We are constantly finding mechanisms to get people involved – whether workshops, information sessions, committees – and the EEC is the catalyst' (R. Côté, personal communication, 29 June 2003).

In Kalundborg the industrial symbiosis continues to remain relevant. In 2002 Noveren recycling centre joined the symbiosis as the latest partner. Noveren is a collection centre for waste and material. Also in 2002, labour strikes in Venezuela interrupted the flow of ormulsion to Asnæs power plant and the plant reactivated its coal input – a key strategy of the benefit of multiple feedstocks (HEWES, 2005). In 2003 an electricity black out in Denmark resulted in damage to the desulferization process at Asnæs; although environmental standards were maintained, the capacity of calcium sulphate produced was reduced, thus limiting output of industrial gypsum. In response, Gyproc turned to its multiple feedstock options and recruited gypsum from another power plant in Copenhagen (HEWES, 2005). By 2004, the regular exchange of gypsum between Asnæs and Gyproc resumed.

Christensen continues to keep in touch with his project teams in Ukraine via electronic mail and, although the teams are continuing the project, he is not living and working in Ukraine to champion the efforts. At this point, it is too early to make a determination about the effect of his departure. He summarized the progress of his teams:

> Cherkassey has investment in their project. They now have very [strong] commitment and ownership – that it is their own thing, that it has to survive. It has sustainability underpinnings, and I am sure that it will continue. It has the support of the NGOs, university, and local community. But Cherkassey is a different approach then Komsomolske, where the Mayor has authority. It is two different societies, two different cultures. But I have chosen them because I knew they were different – they should be different. You come down from your parachute and look around and say 'What is going on here?' You have to learn it. And I learn it. It took two years, but I learn the differences!
>
> (V. Christensen, personal communication 10 October 2003)

Again, the evolution of Christensen's earlier experiments in Kalundborg are instructive to the issue of the longer term viability of EIP projects. Christensen is still active in Kalundborg, where he is currently a city councilor as well as president of the Environmental Club. Although he and earlier colleagues still make their presence known, they acknowledge the new direction of the current business leaders. 'As time goes by, people change. We had a complete washing out of the old veterans – they are completely new people now. You have some cast-weed sitting here', stated Jørgan Christensen, a chemical engineer and former Director of Novo Nordisk a key partner in the industrial symbiosis network (J. Christensen, personal communication, 6 October 2003). When asked to define a 'champion' J. Christensen refused and instead referred to the dictionary. After some discussion he said 'a champion must know possibilities exist, must see benefits both environmental and economic' and when pressed on the departure of a champion he said 'if it is fun and I can still be of use then I will continue, but otherwise I will retire' (J. Christensen, personal communication, 6 October 2003). Both Christensens still live in Kalundborg and are committed to Industrial Symbiosis.

DISCUSSION

The results of this research point clearly to the importance of champions who are able to bring groups of actors together and motivate them to become personally involved in the construction of an EIP. While the Kalundborg project was initially driven by the need for cost savings (EHRENFELD and CHERTOW, 2002) neither team in Ukraine had monetary incentives – they were not wealthy people but they poured many hours into Christensen's project. Similarly, with the members of the Lowitt's steering committee in Devens – time at the monthly meetings was time away from their bottom line – but the people were inspired and wanted to do the 'right thing!' Both Lowitt and Valdemar Christensen were able to steer those desires into productive outcomes. In addition, both had the ability to establish social relationships with team members to develop an aura of trust and cooperation between the participants. Thus, they were each able to use social encounters to inspire and develop a committed project team.

A second central theme related to the need for the champions to be embedded locally within the community. Christensen worked in his community as facility manager of Asnæs power station in Kalundborg and lived for over a year in the Ukraine. Similarly, Lowitt lived in close proximity to the communities where his EIP projects were developed. Jørgan Christensen, former director of Novo Nordisk, a major company in Kalundborg industrial symbiosis also 'embedded' – he lived and worked in his community and was very engaged in the promotion of inter-firm exchanges. Another example of embeddedness is illustrated by Lowitt when he was town planner of Londonderry; he was also an invested partner of the LEIP, because he represented the interests of the municipality. Although he lived in Massachusetts, he worked in New Hampshire where he took an active role as the Londonderry town partner in the LEIP. As a result, he helped to establish the one material exchange that LEIP developed, the exchange of water from the city

of Manchester's wastewater treatment plant, which was piped to AES and used at the cooling towers of the power plant (HEWES, 2005). This exchange resulted from negotiations between the Mayor of Manchester and Lowitt.

A final theme related to project viability after the original champion departed. When Lowitt departed from LEIP in 1999, an area businesswoman, Nancy Hirshberg of Stonyfield Farm Yogurt, became a champion of LEIP. She was also committed to LEIP and when she became less engaged, another business representative took on the role of champion, Gwen Matthews from the AES Granite Ridge power plant. The invested partner of the industrial symbiosis can represent business or the town, as a town planner or a mayor. 'It often takes one person, like a mayor, to push the idea', said Professor Ray Côté of Dalhousie University who is currently researching and promoting EIP concepts in Burnside Industrial Park in Nova Scotia where he lives and works (R. Côté, personal communication, 4 May 2004).

In Kalundborg champions emerged from town officials, too. A Mayor and a former town planner organized a conference in the late 1980s called the 'Developmental Initiative of Kalundborg', which established the Environmental Club and the Economic Development Council. During the Second International Society for Industrial Ecology (ISIE) conference in June 2003, a discussion emerged on the types of EIP champions. According to Koenig, 'In Asia the champions have been a female governor in Thailand, a minister of industry in Vietnam and a minister of environment in Indonesia'. The success of an EIP project requires the development of social relationships from trust and embeddedness – the investment of leaders who live and work in the community, representing partners from business or local government.

CONCLUSION

The ethnographic story of how an EIP is established begins with developing social relationships – the humanistic connections between people. It requires an embedded leader who lives and works in the community and through trust gets local buy-in. Valdemar Christensen lived and worked in Kalundborg. He is invested in his community. His children went through the local schools, his wife is an active volunteer on several committees and he is currently a city councillor having formerly run for mayor. His commitment to his town extends to its environmental protection and its economic viability. In the Ukraine, his project emerged out of trust from inter-personal relationships that grew into the networks that served the project teams.

Peter Lowitt was likewise committed to the Londonderry EIP while he was embedded in the local government as the town planner. Lowitt's background as a town official and his membership in civic groups resulted in his use of business–social settings for collective meetings in Devens. Both leaders agreed that establishing social relationships and trust from embeddedness stems from being able to bring people together. As Christensen (personal communication, 4 October 2003) stated, 'To bring people together which normally don't understand that they need to go together is a role of a champion'. As Lowitt (personal communication, 28 May 2003) put it, 'Set up situations where you put people in close contact with each other, such as the luncheons'.

The findings in this research point to qualitative methodologies and highlight the significance of humanistic connections, specifically the role of EIP champions. While this paper focused on the roles of trust and embeddedness, it would seem helpful to regional planners and policy makers as they embrace sustainable development projects to understand the importance of individual champions to the development of EIPs. As this research states the development of social relationships are necessary to creating an EIP not just the technological connections. The following insightful quote captures the essence of the role of people in establishing EIPs, 'Systems make it work, People make it happen!' (J. Christensen, personal communication, 2 April 2003). The late COHEN-ROSENTHAL (2000, p. 262) wrote:

> celebrating the role of people in industrial ecology leads to better use of materials and energy. Such a strategy makes a material difference in the quality of our lives and the life-giving energy that sustains us.

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