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Constructing a market domain model for start-up software technology companies: A case study

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Abstract

The market for a complex technology product is sometimes called *reference business* because references are emphasized by corporate customers. A first customer reference is especially important for a start-up technology company attempting to enter the business-to-business market with complex products. Topics relating to customer references have received scant attention from scholars although they embed substantial business relevance. This case study concentrates on evaluating concepts that are central to customer references from the viewpoint of the start-up technology companies. Of concepts prevalent in current literature, those concerning the use of the first customer references, in particular, form an inadequate base for research and are often vague. The purpose here is to introduce a domain model that describes the key concepts and the relationships between them concerning the focus of this present article. The domain modeling technique is a well-known and widely used tool for defining concepts for large-scale information systems. Domain modeling increases understanding of the present problem domain by structuring knowledge into classes, attributes, and relations. This case study approaches the identification of concepts via an illustrative example from software business. Previously known concepts, close to the topic of this present article, are then re-evaluated based on our literature review. Redefinitions of the customer reference and related concepts are introduced.

JEL classification : M13 – New Firms; Startups; M31 – Marketing

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1. Introduction

In the practice of industrial marketing, customer references are often needed for convincing potential customers to purchase products or services from a supplier. The importance of customer

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references can be critical for business success. A customer may appreciate a positive reference more than other aspects, such as new technical features of the product not tested in the market. The first customer reference appears to be especially important for start-up technology companies, which aim at producing large, complex systems, such as large software solutions for enterprise information management uses. Start-up technology companies typically need and often want a customer reference to back their credibility.

Customer reference is a well-known concept by the practitioners of marketing, but the area of customer references has nevertheless received only scant attention in academic research (Salminen, 1997; Möller and Salminen, 2006). In general, the commercialization and launch stages are often neglected in the literature on new product development, innovation, and high technology marketing (Beard and Easingwood, 1996). It also seems that technology entrepreneurs' business experience and personality have attracted more attention in the venture capital research than issues associated with product and market (Bank of England, 2001). In the literature, studies by, for instance, Salminen (1997), Ruokolainen and Igel (2004), Ruokolainen (2004), and Ruokolainen et al. (2005) have elaborated on the use of the customer reference. Despite various efforts in the area, the concepts of the problem domain of a first customer reference has received comparatively scarce attention in the area of high technology marketing such as software marketing. This gap in research is what this case study attempts to fill. In this present article, a ''map'', which describes the relevant concepts and relationships between them, provides a holistic overview of the present problem domain, and contributes to our understanding of the investigated phenomena.

1.1. Research objective

The growth of societies is partly based on the growth of start-up technology companies. Start-up technology companies are often research and development intensive companies that plan to capitalize on their knowledge after a breakthrough in the R&D work. Due to the volatility of the high technology market, achieving a breakthrough can be far from easy. Therefore, the overall research interest of this present article lies in the question of how can start-up technology companies realize the market potential. It is believed that the first customer references might play a role in the process of realizing the market potential in a specific business sector.

To be specific, the object of this research is to elaborate on the question of *how first customer references are built* and *how they are used to generate further business*. The following sub-objectives are set: (1) identification and definition of concepts that belong to the problem domain; (2) further investigation of the concepts with the help of the literature to increase understanding of the related attributes; and (3) organization of the concepts of the present problem domain into a model that describes the relationships of the concepts.

The authors' pre-understanding of the research subject is based on a literature review and, for the first author, on his previous studies (Ruokolainen and Igel, 2004; Ruokolainen, 2004; Ruokolainen et al., 2005), and on working as head of a team of project managers whose job was to implement the first versions of software products for corporate customers. No separate footnotes are provided in this article when referring to those above-mentioned research studies.

This article is organized as follows. In the second section, we introduce the domain modeling methodology used. In the third section, an example case is applied to elicit the concepts. In the fourth section, the concepts are defined and related attributes identified. New concepts are then introduced. The fifth section introduces the domain model. The final section presents the conclusions.

2. Methodology

To complement the current discussion in scholarly literature, a method is needed for identifying relevant and missing concepts. The method should provide an innovative, if only illustrative by its powers, angle to the topic of the present article and should be helpful in constructing a deeper body of knowledge for the area of customer referral management. Focusing on describing concepts and constructing the domain model is a means of approaching the ontology of the present problem domain. By ontology, we refer here to the computer science term, which is derived from the philosophical term. In computer science use, the term ontology refers to a set of representational expressions that characterize concepts within a domain and the relationships between these concepts. Gruber (1995) defines ontology in knowledge engineering as an explicit specification of conceptualization, stating that what ‘‘exists’’ is what can be represented. In this paper, having defined the meanings of the concepts, we employ, as in computer science use, the ontology to reason about the objects within our domain. The case research-inspired, illustrative discussion contributed in this paper introduces our key views into the phenomenon at hand. This illustration is presented by way of domain modeling, and graphically supported to clarify the concepts and their mutual relationships. While borrowing this method from the research area of software systems design can be depicted as innovative, its service to this paper is due to the paper's descriptive and conversational nature.

In the process of requirements engineering for large-scale information systems (e.g. Loucopoulos and Karakostas, 1995), various presentations that map key concepts, and their relationships are proposed, such as state transition diagrams, dataflow diagrams, and domain models. Producing these can bring a better understanding of the problem domain. Domain analysis and modeling are used for producing models that include concepts of that specific problem domain in the form of classes, attributes, and relations. The approach of the domain modeling technique that we use in this paper substantively supports the case-research inspired discussion that we contribute here as descriptive research (Yin, 1994). For our research, the use of domain modeling has provided a key supplement to our outline of the set of representational expressions that characterize the concepts and the relationships between these concepts.

Domain models can be constructed using various kinds of presentation diagrams. Gen Voca (Batory et al., 1992) is an object-oriented method for hierarchical domain analysis and modeling. Unified Modeling Language (Rumbaugh and Booch, 1995) uses class diagrams for describing problem domains. In its simplest form, a domain model introduces just the vocabulary of the problem area at hand. In this present article, the combination of verbal descriptions and Unified Modeling Language's class diagrams are used.

Building a domain model is largely discussed by Sommerville (2004) and Pressman (2004). In their view, a problem domain includes real-world things and concepts concerning the problem that the system is being designed to solve. The building blocks for a domain model are identified here with the help of an example case consisting of a story that relates to the problem domain. Candidates for concepts are tangible real-world things that can be conceptualized. Those concepts and real-world things that are redundant, vague, or represent metalanguage or describe operations and do not belong to the research topic should not be considered.

3. Problem domain: concept identification

In this section, the items of the present problem domain are recognized with help of a previously published example case (Ruokolainen et al., 2005). The candidates for concepts have been italicized. The candidate concepts' links to the literature are identified.

3.1. An example case study: building the first customer reference

This case study is about a Thai company. The *entrepreneur* of this *start-up software company* received her *degree*, a Ph.D. in engineering, from a U.S. university. Before setting up her own software start-up, she had gained *work experience* in *software development* at an oil refinery business.

The *first reference customer* of the start-up software company was *one of the largest pig farms* in Thailand, owned by the *entrepreneur's good friend* with whom the entrepreneur had often been in contact since school. This friend and customer had *contacts with major players* in the pig rearing industry. From the entrepreneur's point of view, the case looked like a solid *business opportunity* to develop a *software product* for managing pig farms and for devising feeding plans for pigs.

The idea of the software package was conceived and further developed jointly with the first reference customer. The focus of this *joint development* was on determining the specifications and figuring out the business logic for the pig feeding system and implementing it. The first customer was willing to act as a test site, thus, helping to verify the functionality of the new software. The entrepreneur contacted a professor at a local university to get a better understanding of *optimal feeding plans*. The software product was finalized with contributions from all of the parties involved. The ownership of *intellectual property rights* was not considered. The entrepreneur stated that her team had experienced much learning about how to build software systems.

The software company and the local university arranged jointly *a seminar and an exhibition* for pig farmers introducing the opportunities offered by the *new technologies*. In the seminar, the new software product and the first reference *customer's experiences* of the new system were presented to the pig rearing industry as a success case. The price set for the product was considered modest by these *next potential customers*. The development cost of the software product was financed by the software company.

Soon it turned out that only large pig farms wanted to use the software product offered by the case company. Small and medium-sized farms preferred to use software products distributed free of charge by *medical companies*. Medical companies delivered software products to farms to support their sales and to make pig farmers dependent on them. Large pig farms *did not want to become overly dependent on one medical supplier*. Therefore, they were interested in using software products provided by an independent software company. Taking into account the modest pricing of the new software package and the low number of large pig farms in Thailand, it was clear that the anticipated business would not be profitable.

As the home market could not generate a large enough revenue stream, the case software company attempted to export its product to a neighboring country. An agent, a local software company, was brought in to help in this endeavor. After some software licenses had been sold, the agent disappeared. Many efforts were then made to contact the agent company but all of them failed.

Although the software product was developed successfully, the attempts to earn money from selling software to pig farms ended in failure. Afterwards, the entrepreneur felt that the work done at that time was valuable even though market entry failed: during this initial business stage the entrepreneur and her team gained valuable experience in marketing.

3.2. Concept identification with help of the case example

Based on the description of the example case, a list of candidate concepts is identified. Table 1 presents this list. Each of the identified candidates represents a concept or an instance of a concept. For example, a medical company is an instance of the concept of a competitor in the present context.

A customer reference is assumed to reduce the risk perceived to be present in a venture (Bauer, 1967; Hutt and Speh, 1992), to increase the suppliers' credibility (Blomqvist, 1997; Levitt, 1967) and to increase the supplier's reputation (Herbig and Milewicz, 1993; Doney and Cannon, 1997) and thus we expect references to help start-up technology companies enter markets.

Previously, many research studies that support our discussion here have been carried out even though there is some lack of research in the particular area of customer referral management. Start-up technology companies have been widely studied in the literature by several authors (for instance, Autio, 1995a; Yli-Renko, 1999; Freel, 1998; Huang and Brown, 1999). Several authors (for instance, Freeser and Willard, 1990; Hannan and Freeman, 1989; Maes, 2001) have discussed the effect of the personal background of the entrepreneur on business success. Characteristics of the technology market, including entering the market, have been described by Moriarty and Kosnik (1989), Beard and Easingwood (1996), Shanklin and Ryans (1987), and Sheth and Ram (1987).

Our example case includes several thoughts on how the entrepreneur's *social capital* was used or was planned to be used: the first customer reference was found from the company of an old friend of the entrepreneur's. The friend's relationship to the industry was believed to assist the start-up technology company in entering the market. Generally, aspects of social capital have been widely discussed in the literature by, for instance, Granovetter (1973), Aldrich and Zimmer (1986), Otsgaard and Birley (1994), Eisenhardt and Schoonhoven (1996), Nahapiet and Ghoshal (1998), and Adler and Kwon (2002).

The example case company developed the first product jointly with the customer. Collaboration with a customer in product development has been discussed especially in the

Table 1
Concept identifications

Candidates for concepts	Concepts in the current problem domain
An entrepreneur	A technology entrepreneur
A start-up software company	A start-up technology company
Ph.D., work experience	An entrepreneur's background
A first customer reference	A first customer reference (new concept)
One of the largest pig farms	A first reference customer (new concept)
Entrepreneur's good friend, contacts to major players	Social capital
Business opportunity	Business opportunity
A software product	A technology product
Optimum feeding plan	Sales argument
Joint development with a customer	R&D collaboration with a customer
Intellectual property rights	Intellectual property rights
Introducing new technologies in a seminar or exhibition	Entering high technology market
A medical company	A competitor
Next potential customer	Next potential customer
Customers' experience	A reference business case (new concept)
Did not want to become too dependent on one medical supplier	[Customer's] business case

lead user methodology (Herstatt and von Hippel, 1992; Urban and von Hippel, 1988). The business logic, specification, and sales arguments can be one of the outcomes of the customer collaboration.

Some of the concepts that can be found from the example case are not listed here, because they are not considered part of the focus area of the present research topic. Thus, for example, collaboration with a partner – the professor at the local university – is not discussed in this present article.

4. Concept descriptions

4.1. Customer reference

As noted above, *customer reference* is a well-known concept in industrial marketing, but has yet received comparatively little attention in the literature. Salminen's (1997) description of the reference is as follows: "A reference is the supplier's relationship to its existing/former customer that might be evaluated by that customer in terms of the supplier's product/service, management, and cooperation performance". This description is quite similar to those of reference used in the labor market: "A formal recommendation by a former employer to a potential future employer describing the person's qualifications and dependability" (Wordnet, 2004).

A reformulation of Salminen's proposal for the definition of the reference is suggested because his definition combines two distinct entities for which separate concepts are needed: the relationship to the current or former customer and the performance of the supplier's product or service. The former might tell something or nothing about the latter. The reason for site visits is that a potential customer can verify the customer reference with his or her own eyes, and not just be dependent on recommendations coming from the supplier, reference customer, etc.

Ahmed (1993) mentions the reference in the context of reducing purchase uncertainty. He states that projects executed by the supplier are deemed to be as similar in nature as possible to the current project. His idea for a customer reference is based on the perception of past events building the credibility of the success of future events if a reference case is similar to a current case. One of the problems of using the customer reference is that it can take a long time before a sufficient amount of experience has been gathered. Salminen (1997) quotes two years as a sufficient period.

The concepts of credibility, perceived risk, and reputation are well known in the literature, and they can be related to building the first customer reference. We briefly introduce these concepts here.

Blomqvist's (1997) definition of credibility is as follows: "The actor's perceived ability to perform something he claims being able to do on request". This definition includes the aptitude of the actor to "keep his or her word", which can be one of the elements in building trust with a customer. Levitt's (1967) statement supports the assumption that credibility is one of the key purchasing decision criteria. Levitt describes the meaning of credibility as follows: "When it comes to the most important and most risky of customer actions – actually deciding to buy or to reject a new product – assuming the various suppliers' products to be equal in all respects, source credibility exerts a dominant influence over the other considerations". Especially in high technology and in complex business life, credibility is needed to convince the corporate customer of the viability of the offering. Credibility in the context of the present research refers to the likelihood of customers believing claims put forth by a start-up technology company. An important method for proving a claim in this setting is a customer reference.

The concepts of credibility and perceived risk can be depicted to represent the opposite sides of a single phenomenon. The first definition of perceived risk was introduced by Bauer (1967). Perceived risk refers to the extent to which a customer or client is uncertain about the consequences of an action. Purchase decisions are an important issue in which uncertainty needs to be tackled. According to Hutt and Speh (1992), perceived risk has two components that relate to the outcome of the decision and to the magnitude of the consequences if the wrong decision is made. It can be assumed that sellers' credibility reduces buyers' perceived risk if the seller is capable of keeping his or her word.

Herbig and Milewicz (1993) define reputation as an entity's willingness and ability to repeatedly perform an activity in a similar fashion. Doney and Cannon (1997) define reputation as honesty and the concern of the supplier towards its customers. Reputation and credibility probably go hand in hand: if the company has a good reputation, it also has credibility and, to some extent, vice versa. A question that can be asked is whether the first customer reference increases the reputation of the start-up company. The intuitive answer is yes, and, as noted by Herbig and Milewicz, building a reputation needs more evidence.

In the present research, the concept of credibility is mainly viewed as one of the preferable outcomes of a successful first customer reference, and it is assumed that an increase in credibility decreases the buyer's perceived risk. We do not assume the concept of reputation to be one of the outcomes of the first customer reference, although some increase in reputation by virtue of a positive first customer reference is possible. We expect that succeeding in building several successful customer references will result in a more significant addition to the level of reputation.

4.2. High technology market

Newcomers might find the high technology market challenging despite attractive business opportunities. The high technology market is characterized as a skeptical, uncertain, and labile environment of high-velocity changes (see, for instance, Moriarty and Kosnik, 1989; Beard and Easingwood, 1996). In addition, buyers tend to cancel and postpone deliveries and, therefore, there is a high risk of obsolescence of the products (Shanklin and Ryans, 1987). On top of this, the increasing complexity of the products creates barriers for customer adoption of new technologies (Sheth and Ram, 1987).

It has been demonstrated that the whole business concept including account management and product support creates a base for business success in the high technology market (Shaw et al., 1989). Actually, selling a business concept to customers, instead of just selling the product, leads to a situation where relationships on multiple levels are needed to ensure effective communication. Such extensive communication between buyers and sellers has been called multiheaded customer and seller concept (Gummesson, 1987).

High technology markets can be especially challenging for such start-up technology companies that deliver complex products to corporate customers and that have no customer reference to dispel the uncertainty related to their credibility. The dilemma for start-ups of this kind is to convince the potential first reference customer to purchase a product even though such start-ups have not been able to test the product in real life. This can naturally become a key problem for start-up technology companies regarding the success of market entry.

4.2.1. Partnership theory—the buyer's perspective

In the past, competition and an arms-length approach were believed to help obtain the best price, delivery, and quality terms (Spekman, 1988). *Partnership theory* emphasizes the importance of long-term cooperation, an open and honest relationship and mutual commitment in order to gain the sustainable benefits (Keough, 1993; Spekman, 1988; Asmus and Griffin, 1993). Long-term, intensive cooperation leads to a situation in which it would be difficult for a new player to intervene in the existing cooperative arrangements. Opportunities usually open up in a discontinuity of current technology or business relationships. Start-up companies thus usually have to offer customers new ideas and innovations.

Partnership theory also emphasizes a such "win–win" situation that contradicts traditional purchasing practices: using competition to knock down the prices and to gain better delivery terms (Spekman, 1988). In "reference businesses", such "win-win" situations can be achieved, for example, in a situation in which the customer has the opportunity to get something from a start-up technology supplier that does not yet have a market existence. On the other hand, the supplier obtains positive arguments for entering the market.

Start-up companies might not have the resources needed to take care of big accounts, such as large companies with a centralized purchasing function. It might be useful for start-up companies to use small and medium sized companies as the first customer reference. In addition, the decision process can be assumed to be more straightforward in small companies than in large enterprises.

4.3. A start-up technology company

The report of the Bank of England (2001) defines the characteristics of technology-based small firms as follows: "their success is linked to difficult-to-value growth potential derived from scientific knowledge and intellectual property; they lack tangible assets in the early stages of their life cycles which may be used as collateral; and their products have little or no track record, are largely untested in markets, and are usually subject to high obsolescence rates".

Autio (1995b) and Yli-Renko (1999) have studied new technology-based firms. Yli-Renko's definition for the new technology-based firms is as follows: "(1) they are not more than 10 years old, (2) are independent, that is, not subsidiaries of other companies, and (3) base their business on exploiting their technology resources, that is, are active in developing, manufacturing, or commercializing technology". Autio emphasizes that the founder or founders of new, technology-based firms should have been affiliated with the source of technology before establishing the company. The source of technology could be, for instance, a research establishment or laboratory. Such expectations for affiliation with technology sources and a connection to the research community limit the number of the companies. In this present article, we do not assume that entrepreneurs necessarily have a background in research.

The *New Oxford Dictionary* (2001) defines the concept of start-up as follows: "The action or process of setting something in motion" and "a newly established business". To sum, the term start-up technology company can be viewed to refer to a newly established company that focuses on technology and aims at entering the market with technology-based products or services. In this present article, we define the start-up technology company as follows: "Start-up technology companies are entrepreneur-driven and they design, implement, or maintain complex, high technology products or services. The capabilities of start-up technology companies and their products are largely untested in the markets". Entrepreneurs of start-up technology companies often have a college education. Software start-up companies – the area of business from which we draw the example case – are a subset of start-up technology companies concentrated on a specific technology sector.

4.4. Entrepreneurship research

Entrepreneurship research shows that entrepreneurs of start-up technology companies tend to concentrate on solving technological problems at the expense of commercialization (Freel, 1998). It can be suggested that the characteristics of the entrepreneurs affect the success of start-up companies. On the other hand, it can be assumed that the work experience and education influence the characteristics of the entrepreneurs.

Freeser and Willard (1990) have stated that market opportunities might occur too rapidly for those that do not possess prior knowledge of the business sector. In addition, entrepreneurs with an advanced education are assumed to be more competent in creating relationships with the customer and stakeholders (Hannan and Freeman, 1989). But, for example, Maes (2001) found no correlation between the education of the entrepreneurs and financial performance of small construction companies.

According to the literature, the main investment criteria used by venture capitalists relate to the business experience and characteristics of the entrepreneur (Bank of England, 2001). The report continues that the more recent studies contradict the traditional investment criteria commonly used by venture capitalists. These studies propose that the industry and market factors have more effect on success than the entrepreneur and his or her team. The report makes note of the limited number of similar studies and the small sample sizes used therein.

Autio (1995a) wrote that empirical studies suggest that rapid organic growth is both rare and often even unwanted among new, technology-based companies. Representative of their thinking is a Thai software technology entrepreneur who stated that the profit is a bonus from satisfied customers.

Not all start-up technology companies take the necessary actions of marketing their new products. In Huang and Brown's (1999) view, more than 40% of start-up companies have problems with marketing. The actual reason underlying this might be that the high technology market is difficult to access as described earlier by several authors (e.g. Beard and Easingwood, 1992; Beard, 1995). This, together with the fact that many entrepreneurs have no education in marketing, might create the phenomenon which appears as the entrepreneurs' unwillingness to execute activities relating to commercialization as described by Autio (1995a) and Freel (1998). The remedy might be to increase the marketing and sales knowledge of start-up companies.

4.5. Social capital

Putnam (1995) defined social capital as ''features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit''. Bourdieu and Wacquant's (1992) definition of social capital also includes a time element which is not mentioned in the previous definition. They state that the social capital works only in the networks, in which relationships are permanent. Their definition is as follows: ''The sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition''. In Nahapiet and Ghoshal's (1998) wording, social capital refers to resources that are created by contacts between actors.

The definition of mutual benefit is problematic in the context of small companies: what is the mutual benefit when the purchaser decides to buy products or services from a start-up technology company whose credibility is questionable or nonexistent? Between two or more individuals, the mutual benefit might include the assumption of counter services, which can exceed the scope of business ethics. On the other hand, friendship or sharing the same visions can form the basis for mutual benefit. Tsai and Ghoshal (1998) actually state that there is a strong correlation between trustworthiness and shared visions.

Social capital – referring to past and present contacts and network of contacts – can be assumed to support finding customers. In this present article, we refer by social capital to those resources created by contacts between actors that are useful to start-ups in their marketing process. It can also be assumed that those who have a relationship with a customer may have a better chance of succeeding in entering the market. Several studies have shown the key role of social capital in setting up a start-up company (Aldrich and Zimmer, 1986; Otsgaard and Birley, 1994). Start-up technology companies can use the existing contacts of the owners to find customers or obtain venture capital (Birley, 1995; Eisenhardt and Schoonhoven, 1996). However, the need for social capital along with the innovation process seems to be unclear: what is the role of social capital after gaining a first customer reference or after several references?

4.6. Lead user design methodology

There are different opinions in the literature about the benefit of the lead customer in the research and development process. The lead user methodology of the involvement of the key customer in the research and development process has been reported to positively affect the success of product design (Herstatt and von Hippel, 1992; Urban and von Hippel, 1988). However, some of the studies do not support this. Actually, the customer's involvement has been criticized as limiting the research and development innovativeness (Bidault and Cummings, 1994; Johne, 1994). This is because the customers' proposals are often improvements to existing products rather than radical changes. In addition, the strong involvement of the customer might also lead to a situation where the start-up company ends up in the role of subcontractor, and not developing the product for a large market.

Problems with intellectual property rights have been reported (Bruce et al., 1995): customers, in some cases, have not recognized the intellectual property rights of the start-up technology company to the product and may claim to own those rights themselves. This can, in the worst cases, lead to the bankruptcy of the start-up.

4.7. New concepts

In our view, there is some vagueness and inadequacy in current concepts that concern the building of the first customer references. For example, a problem with current reference definitions is that they include various things that can be recommended to the next potential customer, such as product or service performance, reliability, earned savings, and so forth. From such lists, it is difficult to grasp information concerning what could be essential for potential customers. New or complementary definitions are needed. We propose the following concepts to be used:

- customer reference,
- reference customer,
- first customer reference,
- first reference customer,
- next potential customer,
- reference business case,
- reference business.

In *reference businesses*, typically complex, high technology, and complex products or services for corporate customers in business-to-business market are sold. Credibility is an important factor in sales success. Customer references are needed in order to prove credibility.

The concept of business case is described as follows: "[Business case refers to] information that describes the justification for setting up and continuing a project or procurement. It provides the reasons for the expenditure and is updated at key points during the project or procurement process" (ITIL People, 2005). Another definition for the business case is the following: "[Business case refers to] a justification of why the project is required for the business and what the product is going to be. It should include an outline of the Return on Investment (ROI), or a Cost/Benefit Analysis (C/BA) for the project, the project's product and performance characteristics, major project risks, and the upside opportunities. The project's sponsor is responsible for developing the business case" (ProjectAuditors, 2005).

The new concept of the *reference business case* is defined here as follows: "A reference business case comprises those verified sales arguments that are assumed to match the supplier's next potential customers' business case". A reference business case can consist of sales arguments relating to return of investment and cost and benefit analyses.

A *next potential customer* might be interested in the product provided by a start-up technology company. In order to evaluate and build the business case for using the supplier's product, the next potential customer needs the business case of the customer references, which can be compared to the next potential customer's own business case. The business case of the next potential customer might include that they are interested in obtaining the control of the start-up technology company's intellectual property rights.

Our proposal for the definition of the *customer reference* is as follows: "The customer reference consists of a supplier's commercial product or services and the reference business case of the product or services". A good customer reference demonstrates the attractiveness of its reference business case to the next potential customers. The relationship to the *reference customer*, which provides the *customer reference*, can either hinder or promote the use of the customer reference for marketing purposes.

In the present study, the *first customer reference* consists of the start-up company's first commercial product, which is usually complex, and high technology, and the related business case. The first customer references are provided by the *first reference customer*, which is the first commercial user of the product, and typically a firm.

5. The domain model for the present problem domain

A box in the domain model (see Fig. 1) represents a concept, a class that interacts with other classes. A concept can be another concept's attribute such as the technology entrepreneur's background, in which background can be considered as a concept, although it is an attribute to a technology entrepreneur. A class can refer to one or more instances of another class (see lines with numbers in Fig. 1). For example, a start-up technology company can compete against zero or more competitors. A class can inherit attributes of another class (see lines without numbers in Fig. 1). For example, the attributes of the technology market are expected to be built in the next potential customers' behavior. In other words, the next potential customers inherit the attributes of technology markets in the model. The start-up technology companies' attributes are also affected by the technology entrepreneurs' attributes. The numbers along the lines indicate the numbers of actors of the classes that are involved in the relationship depicted by the line.

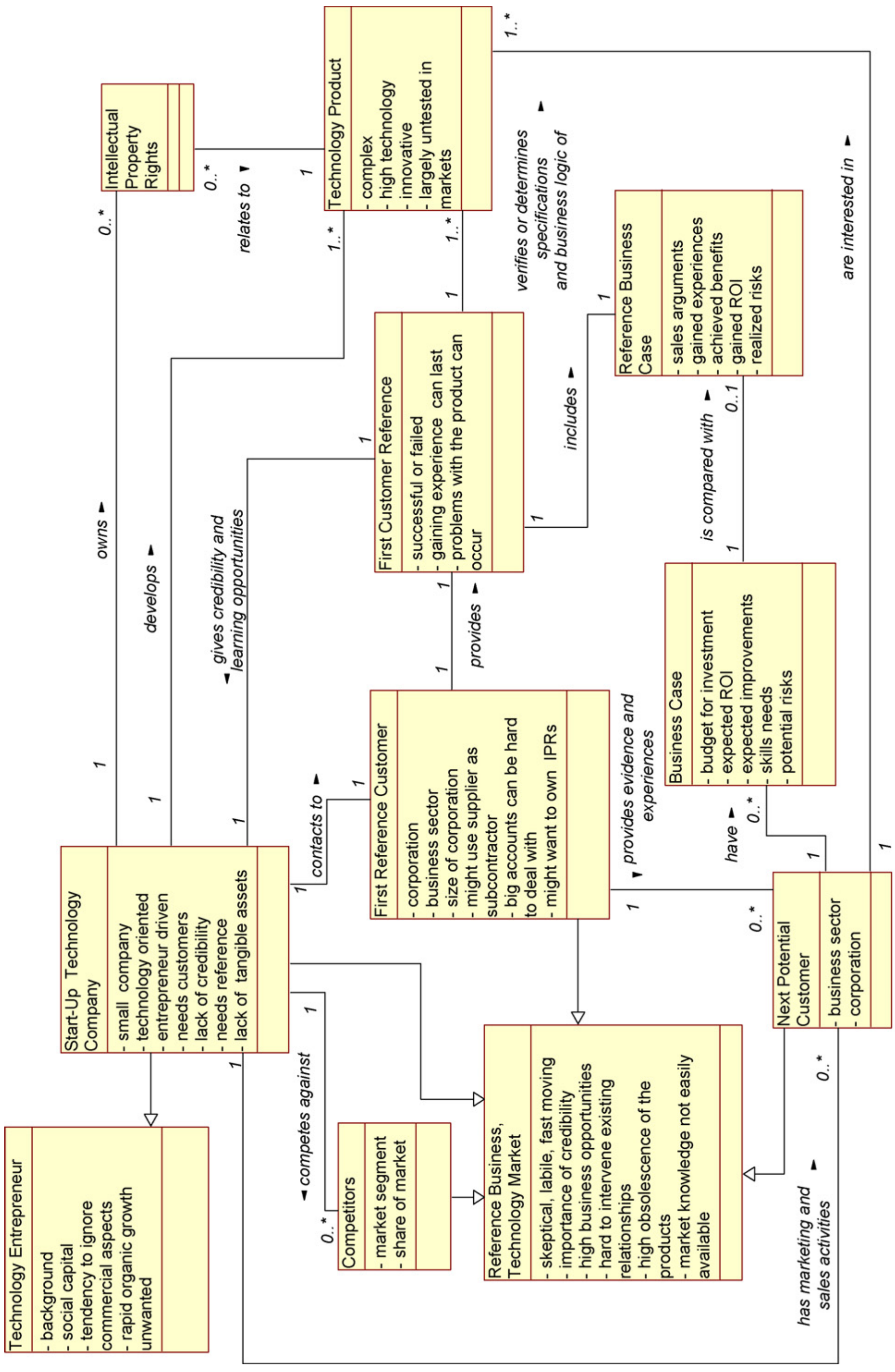

Fig. 1. The domain model for constructing reference business.

The domain model for constructing reference business, which integrates the concepts, is presented in Fig. 1. The integration can be described by explaining the processes relating to the domain model. Two different viewpoints can be presented to the processes, namely the market entry of the start-up technology company and the buyers' purchasing decision-making.

The process for entering the market can be described briefly as follows: the start-up technology company needs a reference customer for its product, which is typically innovative, complex, and high technology. Lacking credibility the start-up company needs to use its entrepreneur's social capital to find the first reference customer. After obtaining the customer, the product must be implemented. The first reference customer might have an interest in the intellectual property rights of the product if, for example, the cost of the implementation and development is not shared between the first reference customer and the start-up technology company. The focus of the start-up technology company should be on collecting sales arguments for the business case to which the potential customers' business cases can be compared.

The corresponding process, which is the interest of buying a product from a supplier, that is, from a start-up technology company, can be described according to the domain model as follows: the next potential customer is interested in the product proposed by the start-up technology company. In order to verify the purchasing decision the potential customer needs to know about the business case of the customer reference. The business case is usually validated by the statements of the reference customer.

6. Discussion and conclusion

In this case study, those concepts relevant to the present problem domain were identified; they are described in Fig. 1. The concepts and their attributes were also studied by searching the literature for references and definitions. Finally, the domain model was created to provide a structure for the knowledge. The resulting model – a *domain model for constructing reference business* – describes elements relevant to this type of business.

Existing literature describes problems a start-up technology company might face when entering a market. Among key difficulties are the following: high technology markets may be skeptical towards new players; the existing buyer–seller relationships are difficult to intervene; and entrepreneurs of start-up technology companies are, in many cases, not commercially oriented persons. In addition, many customer reference studies could advise start-up technology companies to enter the market with their new, complex, high technology products, but are ignored by the scholarly literature.

The topic of building and using customer references is notably an understudied area. Further research should inquire about issues, such as the management of positive multiplier effects of successful customer references, sustaining positive reference relationships, and the effects of dynamics related to the role of the social centrality of the customer reference in the larger sphere of potential customers. It may be that the emphasis in further research will need to be on qualitative research rather than on quantitative research; stressing the former might best increase our basic understanding of the variables related to the topic in the case of a somewhat understudied area. The investigation of the topic can be started from the business sectors in which the references are most important. It is assumed that the first customer reference is especially important for start-up technology companies, which plan to serve corporate customers. Marketing and sales activities of start-up technology companies in general also need more research focus as has been stated earlier.

Based on the domain model and the related literature studies, the following conclusions are advanced:

The analysis of the problem domain indicates that the concept reference can be separated into two different subconcepts, namely the customer reference and the reference customer. Thus, the concepts have different roles relating to success in sales and marketing. The following conclusion is formulated.

> Conclusion 1: The customers are interested in the customer reference, the physical installation of the system, and the related business case, more than in the reference customer, which can either recommend or not recommend the supplier's system to the next potential customers. The reference customer is valuable if its statements validate the claims of the supplier.

Conclusion 2 deals with the credibility gap faced by the technology company. It is assumed that credibility is one of the major benefits achieved by the customer reference. Credibility seems to be one of the key concepts relating to gaining the benefits out of customer references as was proposed by the domain model. The purpose of the customer reference is to narrow the credibility gap. The following conclusion is reached:

> Conclusion 2: The market type affects the size of the credibility gap. The type of market, which is fast-moving and labile, is especially sensitive to credibility. The size of the credibility gap depends also on the newness, complexity, and expensiveness of the product. In addition, a start-up technology company with no reference represents a risk for a corporate customer and, thus, increases the credibility gap. The credibility gap for a new solution offered by a start-up technology company can be narrowed by a customer reference in the labile market.

According to the results of Ruokolainen (2004), start-up technology companies seldom develop good sales and marketing arguments including a solid reference business case, which is, according to the domain model, one of the key components needed in entering a new market. This view receives support from Freel (1998), who states that start-up technology companies have a tendency to concentrate on technical issues at the expense of commercialization. One of the benefits of the model is that it increases the understanding of why finding sales arguments is important. According to the domain model (Fig. 1), the reference business case, and sales arguments verified by the customer reference, should match the potential customers' business cases. Therefore, from the start-up technology companies' point of view it would be important to select to pursue the right type of first customer reference. The following conclusion is advanced:

> Conclusion 3: The reference business case provides information that helps the potential customers' decision-making if the cases are similar to each other. The more similar the cases, the easier the comparison. Therefore, it is important to consider while selecting a first customer reference to be pursued that how to ensure the generality of a reference business case among the next potential customers.

In particular, how to evaluate the generality of the first customer reference's business case needs further investigation. One suggestion to ensure the generality is to test those sales arguments, which have been identified with the help of the customer reference, on the next potential customers.

The final conclusion considers the need for social capital when entering the market. The linkage between the two concepts presented, credibility and social capital, remains unclear.

Intuitively it can be assumed that there is a trade-off between the level of product credibility and the need to employ social capital. The following conclusion can be made:

> Conclusion 4: The consequence of increased credibility is that the need to gain further customers by social capital decreases. On the other hand, the lack of credibility forces start-up technology companies to employ their social capital.

One of the main problems of the start-up technology company is to gain the first customer reference. Because there is, in the beginning, no reference and therefore no reference-enabled credibility, the start-up technology companies might have major problems convincing the next potential customer to buy the product. The first customer reference is most typically found with the help of the contacts that the entrepreneurs have gained (Ruokolainen, 2004).

In the general domain model of reference business, in which a start-up company has more than one customer reference, the following additional concepts can be expected to be found:

(1) The positive reputation based on several references begins to show its role in gaining the next customers. As discussed earlier, the reputation is a result of more than one customer reference.
(2) The importance of a relationship with existing customers from the revenue point of view begins to grow. Especially in the software business, the maintenance costs can amount to roughly equal numbers with the original license cost of a software product. The existing customer can also be a potential customer for new versions.
(3) Competitors can begin to use failed customer references against the supplier. In such cases, the social capital, in the form of the relationship management to the customer in question, could possible provide a measure of shield against the declining reputation.

Several positive customer references can work to show that a supplier's success has not been a random phenomenon. Consequently, avenues for future research include, for example, the formulation of a mathematical model for evaluating the supplier's credibility based on customer references, and, as another example, performing an in-depth case study to evaluate the relevance of the concepts proposed in this study and their linkages and relevance for the various subcomponents of the sales process. A large-scale statistical study would enable the external validity of the conceptual framework proposed in this paper to be evaluated.

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