

The PRT Project

Phase 1 Design & Engineering

Business Strategy



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1 Summary

This document gives an overview over a range of strategic business topics that have been handled throughout the PRT Project. It structures, proposes, as well as discusses central elements of the strategic business ideas around the initiative behind the PRT Project, for POSCO as well as for the other partners.

The mission for the PRT JV may be stated as:

- *Creating a new paradigm in transportation by building the world's first commercially operated Personal Rapid Transport system and change the world's impression about public transportation.*
- and
- *Contributing to a substantial improvement in the environmental effectiveness of urban transport of people and light goods.*

The partners are involved in the PRT JV to support their existing business, as well as to create a new business within the large and fast growing markets of Intelligent Transportation Systems (ITS) and thereby participate in creating better human conditions and at the same time exploiting business opportunities related to environment problems. We develop and build business around the core technology for 21st century transportation systems: Automatic decision systems for transportation and distribution in machine-to-machine based ICT based networks.

Our Strategic Plan plan is staged largely as:

- 1) Establish the PRT JV
- 2) Build the Test Track
- 3) Build core competencies related to PRT
- 4) Develop Intellectual Property that can be protected and form a standard
- 5) Create new Income generators, a.o. financial investment instruments. We might then also expand the scope and use of the Intellectual Property, thereby creating new income streams.

The PRT JV strategy must be formed within a business landscape characterized by

- **customers**, typically Local City Authorities globally, wishing to buy proven technologies only,
- possible **substitutes** in the form of means of transportation in general (LRT, APM, busses, cars, etc), other PRT systems under development, as well as “smart cars” – automatically driven and managed by ICT solutions (“telematics”),
- **suppliers** that to a large part of the potential suppliers are “in-house” in the partner companies, and can favourably be used to “enlarge the value chain” and to diversify and expand into new markets
- **new entrants** that may come into the PRT JV’s market niche, e.g. traditional public transport means, car manufacturers, and process automation industry
- **economic conditions** characterized by the cities’ desperate need of more cost-efficient transportation systems, public budget cuts, and new financial contract models, “Public Private Partnership” (PPP), making it easier to finance new infrastructure projects

- **technological conditions** that are now far more favourable than before to build PRT systems due to modern more cost-efficient ICT and mechatronics
- **socio-demographic factors** that create a huge and growing market for new public transport and changed travel patterns in cities that ask for new transportation modes
- **political conditions** that unfreeze the public transport sector, and opens it for new thinking, and force politicians to look for new technologies to increase quality of life, environmental friendliness and economic growth.

In this “business landscape” we think we will have a considerable competitive edge and a large market due to

- Strength and variation – in scope, culture, markets, networks and reputations of the companies behind
- A cutting edge concept
- High innovative skills
- Mastering of the creativity enhancing project organisation as well as the structured and more strongly planned project organisation
- High productivity cultures
- Affiliated organisations and companies that may take essential roles in the business development

We shall succeed by building a network of partners, suppliers, economic tools, as well as a platform for value added services. This value creation network will make range marketable products based on the primary products - PRT Intellectual Property Rights and PRT Production / Services. Secondary products may exploit the core of the PRT systems to other applications Production and/or Services. Tertiary products will be the Investment carriers, i.e. investment opportunities and instruments in IPRs, Production and/services, in local PRT operations, or in the investment instruments themselves. Hence, there are business opportunities at many levels and in many roles in the value network described. By IP development as well as through the complexity, safety and environmental standards we also build considerable entrance barriers for the competition.

The partners have through the LOI agreed on seeking to develop a business concept that basically relies on the PRT JV and the SPCs. Based also on reports from financial consultants, we propose the business structure, domicile and corporate governance: We suggest Amsterdam before London as domicile for the PRT IP JV. Company byelaws will have to be shaped by a lawyer according the domicile chosen. A Term sheet proposal has been worked out for the Steering Committee meeting of 10th May 2003. (A separate document details the organisational bodies to be established to implement the strategy, as well as their functions. The needs as to organisation of the D&E Phase Two are covered in separate document and are not considered a strategy issue.)

There are some central elements of the PRT strategy that demand some discussion. They are discussed in a separate chapter: The value network, that offers large opportunities as well as challenges; The characteristics of infrastructure value creation systems - network economy, that offer other challenges but may also be a safe “heaven”; Information policy and distribution in the PRT JV and the D&E project; The various meanings of standardisation, and the opportunities as to using standardisation and benchmarking as a strategic tool at several areas in which we are now involved; and finally Intellectual Property Strategy, on which we have detailed the processes and needs involved. (Some patent applications are at present worked out, and it seems probable that more patentable technologies or methods will be developed.)

1.1 Audience for this document

This document is intended for the PRT JV Steering Committee, for POSCO, Telenor & other Partner Executives, for potential Partners and Investors to be, and for the Project Management.

1.2 Purpose of this document

This document gives an overview over a range of strategic business topics that have been handled throughout the PRT Project. It structures, proposes, as well as discusses central elements of the strategic business ideas around the initiative behind the PRT Project, for POSCO as well as for the other partners.

2 The why, what and how of the JV business strategy

2.1 Vision and mission

The mission for the PRT JV may be stated as:

- Creating a new paradigm in transportation by building the world's first commercially operated Personal Rapid Transport system and change the world's impression about public transportation.

More specifically, as to the politically highly important parameter of environment, we have defined the following mission:

- Contributing to a substantial improvement in the environmental effectiveness of urban transport of people and light goods.

2.2 Why we are involved

The PRT JV partners are involved in the JV partly for same, partly for differing reasons:

- POSCO: To create synergies between the affiliate companies
- POSCO: To expand the steel market
- POSCO: To diversify
- Telenor: Local area/property development and potential future business
- Statkraft: Profiling energy from recyclable sources
- Statkraft: To create options for new business
- Interconsult: To get project consultancy contracts
- Get a strong position through the use of own strengths in the large and fast growing markets of Intelligent Transportation Systems (ITS)
- Take part in creating better human conditions by exploiting business opportunities offered from environment problems

2.3 What we are doing

We develop and build business around the core technology for the 21st century transportation systems: Automatic decision systems for transportation and distribution in machine-to-machine based ICT based networks.

2.4 Our Strategic Plan

Our plan in brief is staged as follows:

- Establish the PRT JV
- Build a Test Track
- Build core competencies related to PRT
- Develop Intellectual Property that can be protected and form a standard
- Create new Income generators, mainly:
 - Royalty income from SPCs
 - Shareholders' value of the PRT Joint Venture
 - Return on investments in SPCs
 - Production of equipment and services
- Expand the scope and use of the Intellectual Property, thereby creating new income streams

3 The context for the PRT JV strategy

There are many alternative tools used to develop business strategies. For some years it has been standard to use SWOT to focus on own position relative to the competition and the business context, as well as the “value chain” concept of Michael Porter to focus on dependencies and strategies as to integration and bargaining along the production flow. During last years, the dominant business schools have put more focus on the competitive strengths of clusters and networks. Also, the important role of the “regime”, or the political, social and technological framework – or context – has got renewed attention.

In the Business Opportunities report, we have discussed all these various aspects. Below we sum up this whole picture by using the conceptual model of “The Business Landscape” (after Ghemawat a.o., 2001).

3.1 Business Landscape Overview

The business landscape of the PRT JV is the context in which the strategy must be formed. This “landscape” consists of the *value chain* (suppliers – PRT JV – customers), the *competition* (substitutes and new entrants), and the conditions subject to which the PRT JV strategy must be formed – here defined as *political, socio-demographic, economic and technological conditions*.

The figure shows the general model of the business landscape, and the text sums up main characteristics for each of these elements that shape the context for forming the PRT JV business strategy.

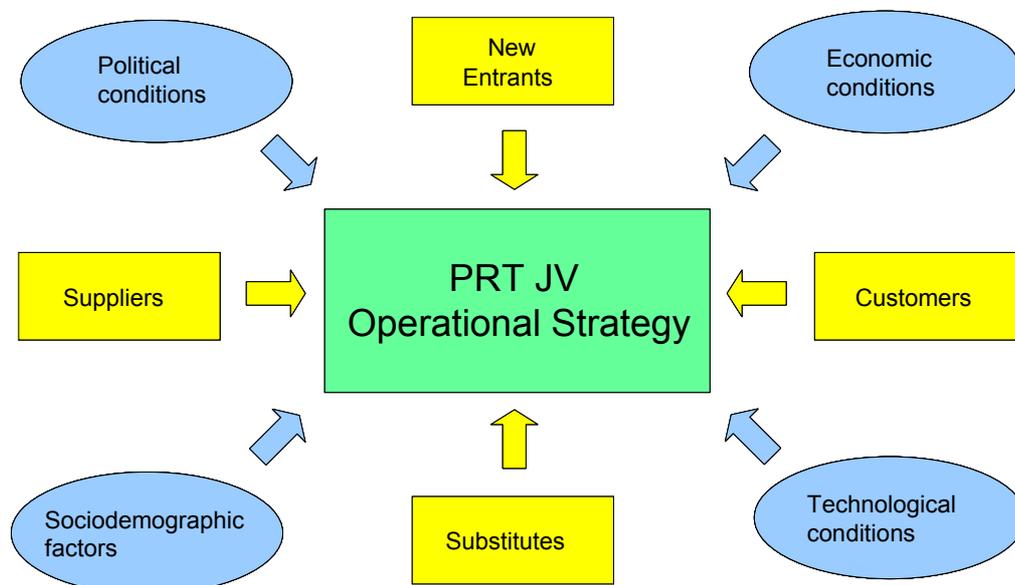


Figure: Model of the Business Landscape under which the PRT JV forms its strategy

Customers are plentiful, mainly Local City Authorities globally. The JV PRT addresses a large market niche. The customers are generally risk-averse, wishing to buy proven technologies only. The JV PRT system will be demonstrated at a test track at Fornebu towards the end of 2003. Once PRT is proven, market’s concern will be mainly if the price is right and that the supplier can be trusted to deliver on time and over time (expansions, and spares for maintenance).

The combined financial, industrial and political powers of the JV partners should satisfy the requirements mentioned to get a strong market position.

Possible **substitutes** for the JV PRT concept will be other means of transportation in general (LRT, APM, busses, cars, etc), other PRT systems under development, and eventual new and so far unknown alternatives. PRT systems in general have within its niche substantial advantages, both functionally, environmentally and financially compared to traditional transportation technologies.

Estimates and design properties of the JV PRT system show very good competitiveness as compared to other PRT systems under development. In particular, one needs to consider Taxi 2000 and Ultra, but we believe them to have poorer technological solutions, as well as far weaker financial and industrial backing.

“Smart cars” – automatically driven and managed by ICT solutions (“telematics”) – would be a possible substitute. We consider them to be no threat: The problems that must be solved to make them similar functionality and environmental friendliness, seem so far impassable within reasonable time: They will be complementary rather than substitutes.

Regarding **suppliers** for the PRT JV business, substantial parts of the JV PRT system will consist of off-the-shelf technologies. The control system as well as vehicles and guideways will need to be customised, but several companies can perform that task. Thus, establishing second sources will not present problems: the PRT JV has several alternatives both in D&E and in later stages of the business.

A large part of the potential suppliers are “in-house” in the partner companies, and can favourably be used to “enlarge the value chain” and to diversify and expand into new markets. There are also potential suppliers as 3rd party companies for all elements. Local suppliers may handle essential works. Through offering local benefits for local industry as well as the environmental advantages of local production, the PRT JV and its partners may strengthen the negotiation power vis-à-vis the customers, and build new business networks.

Who will be the **new entrants** in the PRT JV’s market niche, if any? A successful PRT industry will concern manufacturers of traditional public transport means, as well as producers of cars. They may seek to transform to attack the PRT market niches. For the railroad industry, that may be a slow process. The car industry is far more likely to enter. The industry of process automation should be a good candidate, but is not used to the safety requirements of public transport, and reluctant to engage.

Rather than transforming into new entrants, the incumbent public transportation industry must be expected to lobby against PRT systems being installed.

Economic conditions are generally fairly favourable towards the procurement of PRT systems: Large cities are in desperate need of more cost-efficient transportation systems for ensuring continued economic growth. On the other hand, public budgets are cut down. Outsourcing of public services, imposed through WTO, takes place under new financial contract models, “Public Private Partnership”, making it easier to finance new infrastructure projects, and establishing terms that shall ensure reasonable long term market protection, return on investments, and quality of service.

It has taken more than 40 years to develop the concept of PRT. **Technological conditions** are now far more favourable than before to build such systems, as ICT as well as mechatronics have had an amazing rise in performance as well as cost-efficiency through the last few years. The delimiting factor now seems to be more the human body (e.g. acceptable G-forces) than the performance of technology.

However, the development will continue. In particular it should be expected that there will come more cost-efficient solutions, or alternative – to day more visionary - substitutes to travel, such as “tele-presence” etc. Such solutions should be expected to have limited impact in foreseeable future, and seems no threat to the PRT JV business.

Socio-demographic factors basically create a huge and growing market for new public transport: The cities are increasing beyond capacity of traditional transport modes and acceptable funding. Global warming and health risks from traffic pollution are both high on the political agenda. Additionally, increasingly the numbers of accidents from traditional transport are becoming less and less politically acceptable.

The changed travel patterns in cities – not so much from peripheries to centre as when public transport was conceived, but more travels now between several town areas – ask for new transportation modes.

The **political conditions** seem in many ways to make it simpler than before to open the PRT market now: Liberalisation now imposes PPP schemes practically worldwide. This unfreezes the public transport sector, and opens it for new thinking. Also, politicians are increasingly aware that economic growth must profit on new technologies to be compatible with the demands for increased quality of life, environmental friendliness or economic growth.

Around the world, environmental groups and traffic professionals have formed interesting political-corporate alliances to favour PRT systems, but there has been nothing authorities in charge could buy. By offering a solution, the PRT JV may attract support from local sources of political power, and may help politicians and stakeholders out of their deadlock.

3.2 The PRT JV value proposition

As we have documented in other reports, we are of the opinion that we have a superior PRT in purely technical and functional terms as compared to other PRT developers, that the concept that will be attractive also as to cost-effectiveness, and that we – through our concerted strength and in cooperation with other international partners - shall be able to offer an attractive service level.

4 The products we shall create

As will come clear also from the sections on organisation, we are building a network of partners, suppliers, economic tools, as well as a platform for value added services. This value creation network (a concept discussed in a separate “Reflections...” chapter below) makes marketable products that may briefly be described as follows:

- Primary products
 - PRT Intellectual Property Rights
 - PRT Production / Services
- Secondary products
 - Generic core Intellectual Property Rights
 - Other applications Production and/or Services
- Tertiary products
 - Investment carriers, i.e. investment opportunities and instruments in IPRs, production and/services, in local PRT operations, or in the investment instruments themselves.

5 Building high entrance barriers

To compete in the marketplace may be defined as building barriers against the competition in an environment where other forces try to tear down the barriers or to build barriers to protect themselves from you. Otherwise and bluntly stated, competition is about reducing substitution, and getting control over resources and customers.

The alternative tools for competition are fairly standard as to the parameters. However, practical situations decide the tactical moves along them. Generally, the competition play has to be played along the following parameters that are in many ways overlapping, or may be considered to be precisions of each other:

- Better overall cost-efficiency as compared with products/services considered relevant alternatives to the customer, as measured with the customer’s criteria of comparison
- Adjusting the control span along the value chain to optimize cost
- Lower the product substitutability (differentiation)
- Higher economies of scale
- High initial investments, low marginal costs
- Strong branding & marketing
- Fast development
- Build unavoidable Intellectual Properties Rights
- Other legal protection
- High speed to market / First mover advantage
- Monopoly / protected markets (by nature, law, or any other means)
- Network-externalities (geometrically increased benefit with number of customers/users)

The list of relevant parameters could easily be extended the more we approach any specific industry. Of particular relevance as entrance barriers to our business are the following properties:

- High and specialized competence needs
- Product complexity
- High – i.e. costly, complex and time consuming – safety requirements
- Environmental certifications and considerations used as a competition parameter

The PRT concept we have developed, and the business model we have designed, address a range of these parameters. Below we give an overview that sums up how we position ourselves along these parameters, or intend to act:

Table: General competition parameters, and what we do to use them in our strategy

Better overall cost-efficiency as compared with products/services considered relevant alternatives to the customer, as measured with the customer's criteria of comparison	Cost estimates for the FlyBy case – i.e. the PRT application plan for the Fornebu area outside Oslo, Norway - indicate so far that our solution will be well below APM alternative (Automatic People Mover), with a better service level and better environmental profile.
Adjusting the control span along the value chain to optimize cost	We work along a model with much value creation done with partners (e.g. POSCO affiliates, Interconsult, etc), and for suppliers subject to rigid specifications to meet Safety requirements.
Lower the product substitutability (differentiation)	Inherent in our PRT design. Core technology may also be applied for other products in other markets.
Higher economies of scale	There will clearly be high economies of scale as to central SW and HW elements, planning tools, etc.
High initial investments, low marginal costs	This particularly the case for SW and for some production facilities for high volume.
Strong branding & marketing	(Phase Two and Three)
Fast development	Achieved through the use of small, NorthEuropean informal organisations with professional and experienced D&E project management and a "knowledge based" work style.
Build unavoidable Intellectual Properties Rights	Intended strategy. Started. Realism as barrier is discussed in separate section.
Other legal protection	PPP terms and business arrangements for SPCs will be of particular importance.
High speed to market / First mover advantage	Intended, but may not be entirely reached. There are some relevant competitors who may be market ready around same time. Will be approved with Environment classification (se below in table).

Monopoly / protected markets (by nature, law, or any other means)	PPP terms, market muscles, branding, IPR etc will decide.
Network-externalities (geometrically increased benefit with number of customers/users)	Seems possible to exploit at the specific application level as well as between SPCs in need of interconnection. To be explored in later phases as a marketing question and business opportunity.
High and specialized competence needs	PRT systems D&E is a complex task, with a high need for integration of many professions, particularly when proper Safety and Environmental requirements are also met. Is a clear barrier to competition.
Product complexity	PRT systems are fairly complex systems and under strong regulation. This is a clear barrier to competition.
High – i.e. costly, complex and time consuming – safety requirements	Requires high and long term investments. This is a clear barrier to competition.
Environmental and Safety certifications and considerations used as a competition parameter.	Environment and Safety have high customer priority. Will be met by following newest Safety standards and requirements, and by Environmental Ecodesign methodology, LCA, EPD, and the recently ISO approved assessment (EIA). By doing this, we introduce a new competition parameter that will establish considerable barriers by setting a new benchmark that will be hard to match for established public transport.

6 The overall business system

The partners have through the LOI agreed on seeking to develop a business concept that basically relies on the following two elements:

- The PRT JV
- The SPCs

Below these and other main elements that constitute the business system are briefly presented. Then our recommendations as to their various scopes and missions are presented.

6.1 The PRT Joint Venture

The purpose of the PRT Joint Venture is to develop, own, and get income from Intellectual Property Rights as to a "generic" PRT system. For short, we shall call this PRT JV the "PRT IP JV" in the following of this report.

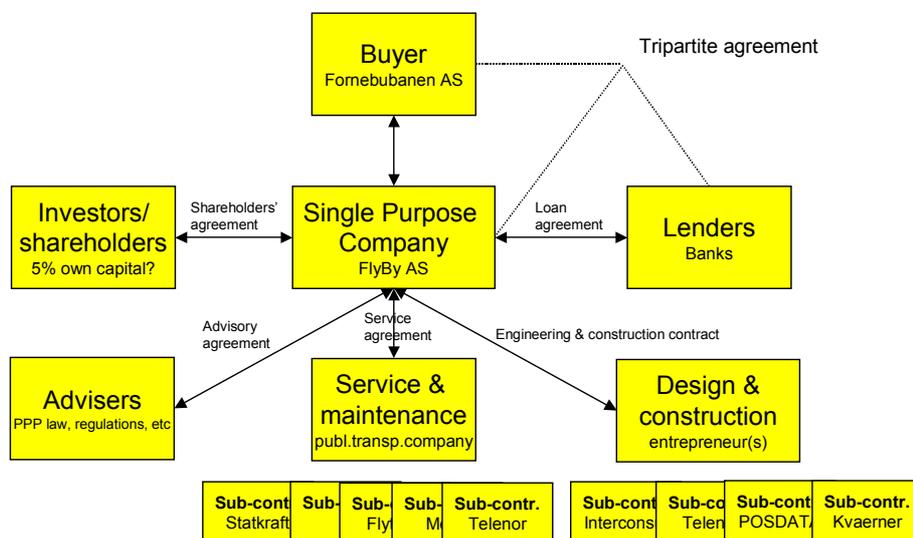
Contrary to earlier envisioned by the PRT partners, it has been recommended by our financial advisers (ProCorp and Maquarie) that the PRT IP JV shall normally not invest directly in the SPCs.

6.2 The Special Purpose Companies (SPCs)

The most common buyer of a PRT system as well as the connected services and IPR, will be a Special Purpose Company (SPC). A SPC operates in a local market, with owners and investors independent from the PRT Joint Venture. The typical SPCs are the local builders, owners and operators of the particular PRT system (implementation).

The typical SPC will operate on Public Private Partnership (PPP) terms with the local government administration as the typical buyer, and will relate to a range of partners, in a value creation network, in which the PRT IP JV and partners may have various roles at many positions in the network. The illustration shows a typical setup. Accordingly, the PRT IP JV and its partners will typically relate to any specific SPC as suppliers, eventually also as consultants as well as investors.

Figure: a typical setup for the SPC on PPP terms (FlyBy example)



6.3 Production / Services for SPCs

As far as the business agreements with the PRT IP JV approve, the design, construction, operation as well as other services are provided as to the decisions of the SPC. The PRT IP JV will have to set regulate the terms for such third party products and services, as the consequences for the quality of service, liabilities as well as safety will be heavily influenced.

As long as the PRT IP JV offers the preferred product, these terms provide business opportunities for the partners of the JV, as well as for the preferred suppliers.

6.3.1 Investments in SPCs

The SPCs will need financing from investors and/or owners. In PPP operations, it is normal that the major suppliers of design & construction as well as service & maintenance are among the owners / investors.

6.4 A financial JV

Accordingly, the JV – or any of its partners – may engage in investments in the SPCs - as a group or as single actors. Under normal circumstances, the PRT IP JV will not engage directly in investments in the SPCs, but should consider whether it should set up a separate Financial JV for this, as recommended by ProCorp and Macquarie.

The PRT market does at present not exist. Ordinary investors will therefore most certainly be very reluctant until the JV PRT is considered proven, and the concept of PRT has showed to be attractive.

To trigger the market, a show case has to be made. For this purpose, the partners of the PRT IP JV should invest directly in the first SPC case, whether it be at Fornebu, or any other place (Stockholm, Song Do, or else). Such investments may be in kind, e.g. through provision of planning services, or through a high discount on services or software.

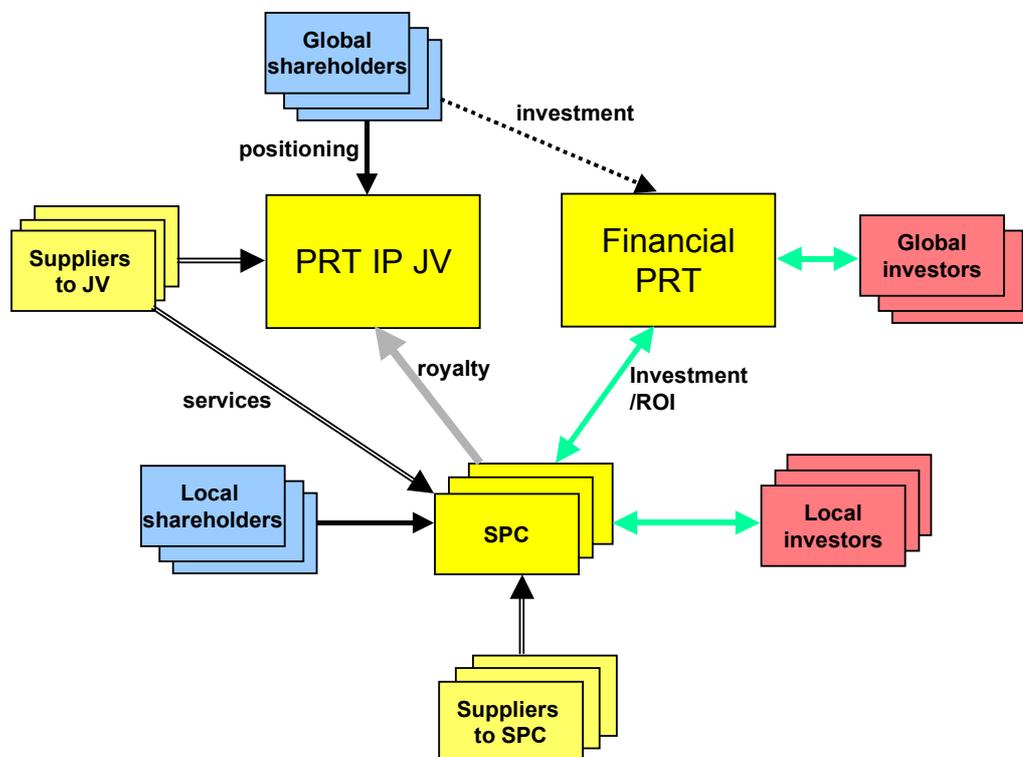


Figure: A schematic overview of the many optional business roles of the value network

6.5 The various business opportunities in the value creation network

As described above, there are business opportunities at many levels and in many roles in the value network described. The figure indicates in a schematic the many optional business roles of the network. The corresponding investment opportunities have each with their own risk and potential return profile:

1. Investment into the PRT IP JV
2. Investment into the Financial JV
3. Investments into suppliers to the JV
4. Investment into Financial JV Investment instruments (funds a.o.)
5. Investment into the local SPCs
6. Investments into suppliers to the SPC

7 Scopes and Missions of the Business Units

Below we present some considerations – as well as prescriptions – as to various scopes and missions of the business units involved in the business system presented above. This section is based on the strategies evolved over time both within the POSCO and Telenor PRT studies, the ProCorp and Maquarie considerations, and our own business development competence within the D&E team.

7.1 PRT IP JV business model

The PRT IP JV will be a technology-based company, which will develop and market the JV PRT technology globally.

The tasks of the PRT IP JV will typically be

- Development and protection of JV PRT technology (Intellectual Property, IP)
- Licensing this JV PRT technology to technological specialist suppliers which again deliver products and services to local SPCs. This will in particular concern generic PRT parts (guideway, vehicles).
- Secure conformity for the PRT system towards major safety and operational standards with assistance from local regulatory bodies and SPCs
- Continuously improve the JV PRT technological system
- Licensing operational rights to SPCs
- Assist SPCs in negotiating PPP contracts
- Conceptualise, develop and spinning off new types of PRT related businesses
- Develop franchising models for SPCs, facilitate the establishment new local SPCs, probably through part ownership and assist in successfully submitting PRT bids
- Eventually, acquiring full or part ownership in such supplying firms, or establish new firms from start. This will in particular concern key PRT components (Bogies, vehicle tops, control system, software).

Revenue sources for PRT IP JV

- Technological licensing fees from suppliers to SPCs
- Dividends from wholly or partly owned suppliers to SPCs
- Franchise licensing fees from SPCs
- Operational licensing fees from SPCs
- Diverse from spin-off activities

Preliminary Strategy for PRT IP JV

- Installing a full-scale test track by the end of 2003
- Use primarily specialist contractors and consultants for development
- Decide office location and functional division of tasks among geographical sites
- Start recruiting and educating core people for the future business
- Start to build up worldwide human network to prepare for opening of the PRT market

Investors in PRT IP JV

Investors in the Primary JV will be long-term investors. They will be two types of investors:

1. Industrial investors who wish to get in position to supply goods and/or services to SPCs globally.
2. Financial investors who are looking for particular dividend characteristics.

The investment risk profile will be very different in the two stages:

1. Before PRT technology is demonstrated: High capital requirements, high risk of investment recapitulated through increase in share value.
2. After PRT technology successfully demonstrated: High capital requirements, low risk of investment, dividend focus.

It is assumed that the PRT IP JV will remain a privately held shareholders' company. When one or more PRT projects have successfully been put into operation, companies delivering traditional transportation technologies, such as Bombardier, will probably wish to submit bid on the PRT IP JV.

7.2 Financial JV Business Model

The Financial Joint Venture will be a specialised project-based financial enterprise helping the local SPCs to put together financial packages for local PRT projects.

The Financial JV will establish and manage special investment funds, which it will market primarily to institutional investors, providing to these investors investment opportunities with a risk profile close to government bonds, at above government bond returns. In general, significant capital will only be required after a local group of investors/SPC has got a PRT contract.

The tasks of the Financial JV will typically be

- Recruit local or international investors for the particular SPC project or portfolios of SPC projects through investment funds
- Acquire part or full ownership in SPCs
- Assist SPCs in negotiating PPP contracts
- Finance as loans part or all of SPC obligations according to PPP contract
- Continuously developing new financial instruments or methodologies for SPC projects

Revenue sources for Financial JV

- Fees from managing funds for investors
- Interest payments from loans to SPCs
- Dividends from partly or wholly owned SPCs

Preliminary Strategy for Financial JV

- Secure in the order of NOK 5 million to establishing a permanent core organisation
- Use specialist consultants for development until core people in place
- Decide office location and functional division of tasks among geographical sites
- Start recruiting and educating people for building a worldwide virtual organisation around the core

Investors in Financial JV

Investors in the Financial JV itself will probably partly be the same as investors in the PRT IP JV. In addition, there will be central institutional investors who will want to invest in the Financial JV investment funds. Investors will be long-term and will focus on dividends.

When PPP projects are agreed with local authorities, significant capital will be required. But time frames to supply capital are long, and risk will in most countries be low and well known once the PPP terms have been negotiated.

7.3 Special Purpose Companies (SPC) business model

Special Purpose Companies (SPC) need to be established for each local PRT project, as owner and operator of the local PRT system, as the private partner in the local Public Private Partnership (PPP). A PPP is a partnership between the public and private sector for the purpose of delivering a new project or service traditionally provided by the public sector.

In the case of a PRT system, a PPP would primarily mean that the local government grants the SPC exclusive rights to install and operate the PRT system within a defined area for a number of years, and that the private sector installs and operates the system against a right to a part of the operating revenues from the system, or a fixed fee (cost plus). Eventually, the local government pays part of the system costs. Successful PPP negotiations are essential to SPC profitability, a.o. to protect the operation from destructive competition (see section on Network economy).

The SPC will primarily arrange and negotiate PPP agreements, oversee planning and installation and be in charge of operation of the system.

The tasks of the SPC will typically be

- Submit tenders to local authorities and negotiate PPP contracts
- Secure installation- and operational permits from local regulatory bodies
- Coordinate installation of PRT project
- Recruit capital to the project from local or international investors, or from Financial JV
- Operate and maintain the PRT system
- Provide feedback to JV for system improvements

There will also be derived opportunities, directly or indirectly, e.g.:

- Use guideway support beams to provide cheap cabling for fibre optic, telecom, electrical and cable television cables
- Complementary transportation services
- Park and Ride services
- (Wireless) information services in the vehicles and stations

Types of customers for SPC and spinout companies

- Local Authorities
- Individual passengers
- Goods transport companies
- Aggregators of passengers such as corporations

Revenue sources for SPC

- Parts of operating fees from PRT system or fixed fee
- Dividends from derived businesses
- Sales of shares in derived businesses

Preliminary Strategy for SPC

For Fornebu, a Consortium is established, and an SPC will be established when necessary (probably to sign a contract). The Consortium will focus on qualifying as a tender to the project, and subsequent bidding and negotiation. A small permanent organisation, as by now, is to be hired.

SPC Investors

Investors in the SPC would look to the long term. They would typically be:

1. Financial JV
2. Local industrial companies who wish to deliver products and services to the PRT project
3. Local financial investors
4. Local property owners within PRT area
5. Local authorities

Good transportation means significant increases of property values. Property owners have thus incentives for securing the establishment of a PRT system covering their property.

The investment risk profile in the SPC will be different according the two stages:

1. Before bid is secured: Low capital requirements, high risk of investment
2. After contract granted: High capital requirements, low risk of investment

8 Setting up the Joint Venture Organisation

The Phase One project team has with the help of ProCorp and Macquarie worked on preparing for the elementary steps of setting up the PRT IP JV. The following are our proposals.

8.1 Choice of domicile of PRT IP JV

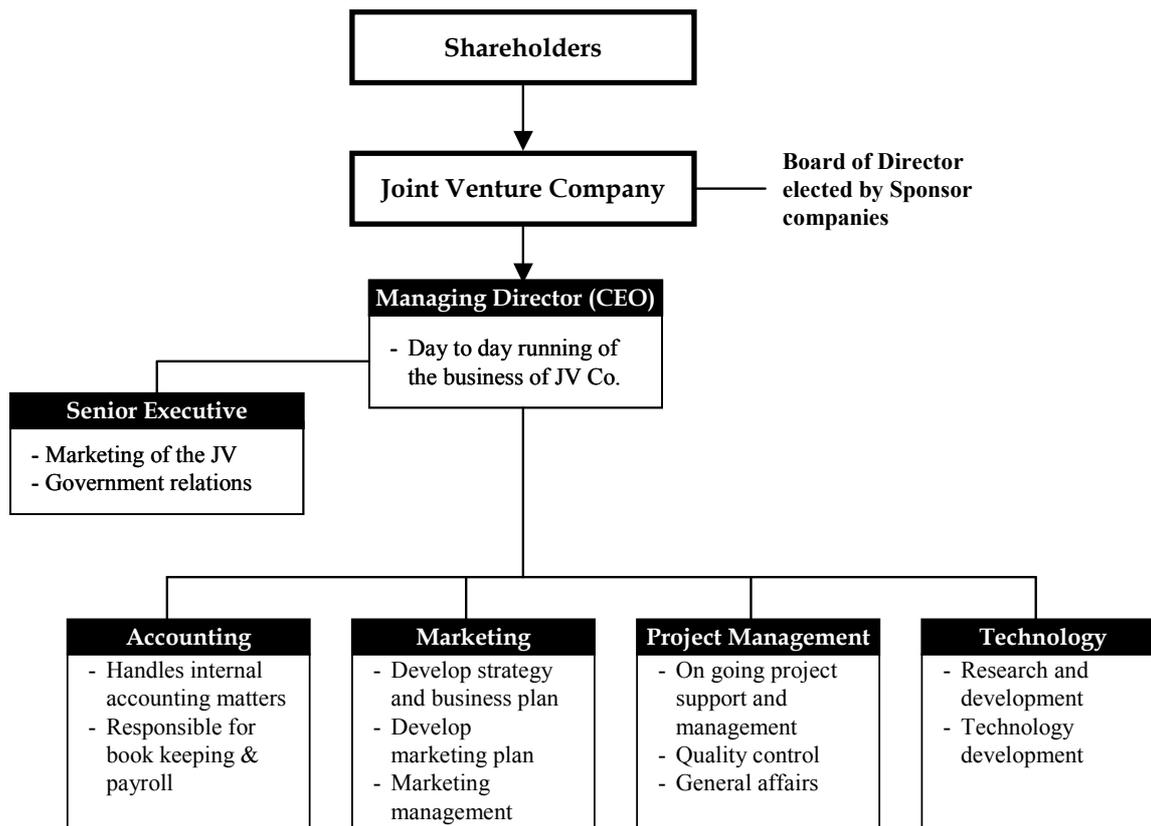
The domicile of the PRT IP JV is where the company is formally registered. It may have more or less of its activity there – or none but a mailbox. The domicile is therefore in the outset just an address to be decided on as to where there the suitable juridical and financial regimens are to be found.

However, in practice, there will probably be some activity there, maybe even headquarter and business activity, and the eventual Financial JV would probably for reasons of simplicity be located in the same country.

ProCorp has suggested **London** for reasons related to financial and juridical matters. ProCorp stresses that there are other almost as good alternatives, mainly *Amsterdam* and *Ireland*. ProCorp also underlines that London could be a costly alternative. ProCorp also underlines that the financial and juridical matters are not necessarily the only elements that should be considered.

We suggest **Amsterdam**, for the following reasons that we think should be considered of equal importance:

- Less risk for terrorism – particularly after recent British Middle East engagements – and better reputation world wide
- Easier to market a Dutch technology company than a British one on the European continent
- Dutch do more easily understand other cultures than do the British (or the US American or French), and have a strong historically rooted understanding of being a minority / the weaker part
- Closer to continent
- Efficient communication/transportation globally
- Country in extreme need for environmentally friendly transport solutions, and a Ministry of Transportation very active in the search for ITS solutions. This may mean favourable PRT contracts and reference installations.



8.2 Company byelaws

Are fairly standard, and will have to be shaped by a lawyer according to the domicile chosen.

8.3 Shareholders' Agreement

ProCorp & Macquarie have worked out matching suggestions as to a Shareholders' Agreement. On this basis, Mr. Dag Sanne, BBU, has worked out a Term sheet proposal for the Steering Committee meeting of 10th May 2003. The Term sheet is distributed separately, and is not a part of the set of deliverables for the PRT Project Phase One.

8.4 Organisation structure of the PRT IP JV

Macquarie has proposed a very much standard setup for the essentials of a JV organisation (see figure), as well as a standard description of roles. The organisation aims at the situation after a business activity has been started, but general enough also to be used for the D&E Phase Two. For further details, see Macquarie report: PRT Project - Commercial Terms, Corporate Governance and Value, 23 April 2003.

The more specific needs as to organisation of the D&E Phase Two are covered in separate document and are not considered a strategy issue.

9 Reflections on strategy and challenges as to PRT business

There are some central elements of the PRT strategy that demand some discussion. They are discussed below.

9.1 The value creation model – a business opportunity as well as a cultural challenge

The value creation model depicted above has the form of a *value network* – as opposed to the commonly used concept of a value *chain*. In value networks, partners form clusters in which they are mutually dependant on each other's performance and deliveries. Important parts of the production typically do *not* take place in a time-sequenced chain of input factors, process, and output.

Value creation in value networks is well known from banking, airlines, telecom, and many other businesses where a complex web of suppliers even have to deliver simultaneously to create the product or service that is actually supplied to the customer. Such networks make it possible to create values that none of the players would be able to create alone.

In value chains consisting of independent market players, the market, i.e. competition, decides prices for input factors, process, and the resulting product or services. In integrated value chains, internal pricing is a constant (and often highly political) issue.

In value networks, there will always be a challenge for the partners to decide where in the network to take out the profit, as market mechanisms cannot easily be used: E.g., in the PRT JV case, it will be a matter of negotiations whether IP licensing fee for building tracks should be costly, or it should be a higher margin on track production. Value networks thus invite for concerted action and the constant seeking of good relations, working for the common good, as well as seeking a reasonably balanced power structure.

Both in Asia as well as in Europe, value networks are common. However, the prevailing American business school model has for long been focused on exploiting the bargaining situation of the value chains. Therefore, it is has become counterintuitive and a challenge to Westernized and scholarly business people to work in value networks. Also, there seems to be a certain difference in business approach, as Asian business culture more commonly start with seeking value networks and end with harder re-negotiations on terms, while Europeans more tend to seek strong positions, and eventually end up with value networks. It seems clear, that all partners must keep in mind this difference that is built in to the JV, and strive actively to keep the value network in good balance.

9.1.1 Network economy – the strength, as well as the particular need for efficient barriers

In a transportation network as PRT, investments are high, but running operational costs are probably fairly low. They are probably also largely independent of traffic volume. Also, costs – in terms of investments as well as fixed costs of operation - will be determined by the peak capacity needed, while income will be determined by the mean used capacity. (Although, the PRT system operational costs are probably less fixed than for an APM solution, being far more flexible both as to vehicle capacity in use as to scalability and re-arrangements of the physical network.)

Such economic characteristics are named "network economy", and are typical to many infrastructure systems and several kinds of production, e.g. steel mills, telecom networks and hydroelectricity power production.

As marginal costs are next to zero, such value creation systems may have a large capacity to lower prices with competitors, but may be extremely vulnerable to competition if competitors are free to attack just the most profitable part - with no obligations as to the rest of the service provision.

E.g., if a bus company – with very low fixed costs - were free to operate along the track just in rush hours, with no service outside rush hours, it might be a dangerous competitor.

For value creation systems, it is essential that the terms of competition are regulated such that reasonable long term safety for the investment is provided. In the case of PPP agreements, such will be a matter of negotiations, and must be carefully watched.

The upside of such a value creation system is that the expenses of the spare capacity outside peak hours are already covered. If alternative use of the spare capacity is found, it may become highly profitable business (as the SMS service in the GSM world). In the case of PRT, there may be a substantial such market that may be developed.

9.1.2 Information policy and distribution in the PRT JV and the D&E project

The PRT IP JV is to be established as a separate business unit. It is not to be a subsidiary of any of the partner companies. The consequence of this is that reporting as well as command lines and economic responsibility is a matter between the Steering Committee (later the Board of Directors) and the Project Manager. It is to the Chairman of the Steering Committee as well as to the other members to have the mandates necessary for the project, whether it is on a case basis or as a general mandate.

It also means that the participants in the D&E project shall not distribute information of any business critical kind out of the project group, even not to partner companies.

The handling of such an information policy is a must to protect the JV IPR. However, it is contrary to Korean corporate business culture, where it is common to consider a joint venture as an in-house undertaking. Such a strict information policy must also be handled in a soft way, as it would otherwise severely delimit the synergies possible in the Joint Venture partnership.

9.2 Standardization

Standardization plays a central role in the PRT strategy. However, the term "standard" or "standardization" may be interpreted in many directions, e.g.

- Industry standard
- Modularity
- Public published standard
- Unavoidable patent
- Market dominance

We have achieved some results for some of these meanings, and have some reflections as to others of the interpretations of “standardization” given below:

1. To construct and establish a benchmarking philosophy, methodology, and/or parameters list (e.g. LCA).
 - a. We have established a set of requirements that may become essential parts of such a benchmarking standard, as we have:
 - i. Identified safety requirements
 - ii. Specified parameters for operation
 - iii. Designed, and close to engineered, switch and rail system
 - iv. Sketched an ISO-standard based environmental declaration of PRT
2. To get the benchmark results that others will use as reference for evaluation (e.g. Tandberg videoconferencing equipment)
 - a. We have decided on properties that will be more demanding but more attractive for the buyers, than other PRT systems we know. We have done so, we believe, without a negative impact of overall costs. *Hence, if we succeed, we might “define the standard” in the sense of setting the benchmark that other systems will be measured against.*
3. To build a core and / or definition and/or solution and get it to dominate the market (e.g. MS Windows) so that others will choose to adhere to it to their own advantage. Such market strategies may be based on network externalities (MS Windows, interconnection based structures like telecom).
 - a. It seems possible to set standards through economies of scale, i.e. through price competition. *Eventually, this will be an effect of success in the market.*
 - b. It seems difficult to build dominance through network externalities, as there seems not to be serious disadvantages of not interconnecting local PRT systems. May be on the contrary: PRT may play a role as feeder systems. In that case, *there may be economies of scale, but no network externalities, and no standardisation due to interconnection needs.*
 - c. We are on the way to develop a combination of solutions on the mentioned parameters (safety, operation, switch and rail, environmental properties) that may be possible to protect as Intellectual Property. This does, however, not make it any market standard unless competitors find it attractive as a platform for own development. *Such a situation is at least a year ahead, if such a position will be reached at all.*
4. To make a specific core and/or definition and/or solution decided on as the obligatory, imposed or recommended solution through public law or recommendation (e.g. CCITT H.323)
 - a. To set a standard in this sense, there must be a felt need for such a standard. For PRT there is no such felt need for the authorities at present, but there might be when some implementation(s) of PRT have built a market. *The Phase One D&E project has not engaged in any such activities.*
 - b. At present, the many various aspects of PRT are subject to different laws and regulations in various countries (see e.g. Safety report). To the extent these laws address transportation at all, they are dominated by the thinking of traditional trunk based transport. To unleash the market, such laws and regulations should be revised to open for PRT and similar. Such a task would be suitable for a research institute or a consultant company. *The Phase One D&E project has not engaged in any such activities.*

- c. Such processes take years, mostly as a combined undertaking by industry, standardisation organisations, professional interest groups, governmental authorities, and the international or national standardisation bodies. *The Phase One D&E project has not engaged in any such activities.*

9.2.1 On what area may we achieve to set standards?

It is possible to see some areas where we may achieve to set standards in the sense of making our IP or properties of our PRT solution unavoidable:

- Environment – by introducing ISO approved benchmarking system also on public transport
- Safety – Not clear
- Software – May be on the domain of algorithms for some part of the control software? Very open
- Hardware? – Switch and rail system is now under consideration by patent attorney. Other elements may be within vehicle cabins? Very open
- Else? – The topic remains to be explored

9.3 Intellectual Property Strategy

IP protection is used to hinder others to use a specific intellectual property. Intellectual Property is core of the PRT IP JV strategy.

IP Strategy is about how to handle the Intellectual Properties created in the D&E work and other processes in the PRT IP JV: Should it be protected? -Eventually by law, and thereby at some point in time disclosed to the public? Or should it just be kept a secret as long as possible?

The options arising as to how to manage the IP involve strategic long-term decisions down to the day-to-day follow-up of individual inventions/ applications. Accordingly, it is clear that decisions as to IP protection are intertwined with the business strategic and tactic decisions.

This section is based upon discussions and proposals received from Zacco AS and CURO AS, the two best known patent attorneys (or patent law firms) in Norway.

9.3.1 What may we protect?

To have an exclusive right to a specific intellectual property, it must be registered under a **patent**, a **design registration** or a **trademark registration**.

We may under national and international law in most countries protect under a **patent**:

- technologies and methods, in hardware as well as software or mixed
- business process technologies
- business models (USA only, increasingly restricted)
- Old technologies used in new applications (to some extent be patentable)

Technologies and/or production methods that are not new, or that are generally known, or are already applied for by others, cannot be registered under the current patent laws.

Accordingly, names and shapes that are generally widespread, common, or “a property of mankind”, or already registered or applied for by others, cannot be registered.

In other terms, it is possible also to register, and thereby protect, non-material elements of commercial interest other than technologies or production methods, such as

- Designs and “valuable look”
- Trademarks
- Names
- Logos

We will restrict the rest of this section to patents, and to IPR (Intellectual Property Rights) as a whole.

9.3.2 Two patent filings in the process

At the moment of writing, the PRT JV D&E project group is filing for two patents - for the switching and rail solution, as well as for the control system principles.

9.3.3 What more may we patent?

Apart from that, the PRT JV D&E is still in a too early stage to have any clear view as to what may be patented. Generally speaking, we may expect to find patentable solutions within all areas we are working – large or small - within:

- Control systems
- Mechanical design – of vehicles, guideways, rails, production methods, etc
- Environment, e.g. impact assessment methodology
- ICCS - support systems, ticketing, radiocomm...
- Business models (USA only, eventually)

There will be a continuous need for collecting and presenting such information in order to maintain a good overview over the total situation of IP development. In a rapidly growing organisation this requirement will be particularly demanding, as there from month to month will be new employees that will have to be at least somewhat informed of status and new projects.

9.3.4 To patent – wise or stupid?

The content of a patent must be disclosed to the general public. By disclosing, the applicant actively gives all interested parties easy access to a description of the problem to be solved, and the solution seeking protection. It is then up to any contender to try to create a substitute by finding a different method or technology to solve the same well defined problem.

Is it then at all smart to patent? In a specific situation, it may be might be better to leave competitors without insight in neither the problem nor knowledge of the solution, instead of giving them such information that they can use to build up a substitute. In such cases one must find other ways to protect the IP.

Whether to patent is hence a tactical consideration based on the answers to the following questions:

- Is the problem commonly known?
- Is it easy to work around the problem?
- Is it easy to find other ways to solve the problem?
- Can the expected/potential income defend the costs?
- Is it possible pursuing infringements?

Whether to patent cannot be answered generally or a priori, but must be considered as part of the daily operations and tactical decisions of a company based on a business model centred on IP.

9.3.5 Fast to register, slow to get

As shown below, it is very fast to file a patent application, and thereby – under certain conditions – block the competition. However, the lead-time to have patent approved, is extremely long, even within a home country.

These long waiting times are due to the international patent organisations, and independent of the patent attorney used.

The long lead times make it attempting to conclude that the most interesting part of a patent protection will in many cases be the filing, not the actual approval. Such considerations may vary according to what shall be protected.

Figure: Time Schedule for Handling a Patent Application

Pre-filing work:	
1. Initial meeting	
2. Patent search by PO	2 weeks
3. Assessment and decision on filing	
4. Preparing/drafting patent application	1 - 4 weeks
Filing procedure:	
5. Filing domestic	Immediate
6. PO search and examination	4 – 8 months
7. Assessment of PO report and considering meantime development	
8. Filing response and new claims	
9. Filing PCT application	11 months
10. PCT search	15 - 16 months
11. Publication of domestic and PCT applications	18 months
12. PCT written opinion (if ordered)	23 months
13. PCT preliminary examination report	27 months
14. National/regional filings	30 - 31 months
15. National examination reports	36 - 50 months
16. National/regional grants	40 - 60 months

As shown, handling of patent applications is a very slow process, which may take years – even for an individual country. However, as soon a patent application is filed (FPA) - normally some months after handing it in, it will protect the applicant worldwide for 12 months, provided the invention does not turn out to infringe existing patents or patent applications.

Others cannot patent the technology or production method as long as an FPA is filed. However, *if others start to use the same technology or production method, it is not an infringement of the FPA as long as the content of the patent is not disclosed. The protection under an FPA is therefore only partial. Disclosure may therefore part of important tactical considerations in the Business strategy context.*

9.3.6 Patent infringements

If a patent is considered infringed, it is up to the holder of the patent to pursue his rights. This will normally imply juridical work, eventually with the supposed infringer taken to court, to stop the other party from infringing the patent, or to impose some kind of licence fee.

To survey that patent rights are not infringed, may therefore be costly and long lasting operations. For a company with a business model based on the management of IPR, it therefore seems to be essential that the IP is not easily copied.

9.3.7 The functions in IP strategy

For the purpose of overview, the essential functions of IP strategy are listed below.

- Designing an IP Management and Strategy Plan for taking care of the IP rights of The PRT-JV Project.
- In-house IP handling routines establishment, including reporting and control formats and forms, as well as an IP-database program to handle information storage, reporting, taking care of terms etc.
- Manage communication between inventors, patent law firm and management and JV-partners
- Handling patent and trademark searches
- Considerations regarding filing-non-filing regarding applications for patents, design registration and trademark registration, the time for filing and the structure of the applications, based on pre filing search.
- Preparing and filing new applications (patents, trademarks, design)
- After the application has resulted in a Patent Office action, assess the outlook for the patent application and its possibility for grant of a protecting patent.
- Full international IP filing and administration service, including administrating work done by cooperating law firms worldwide.
- Terms surveillance as to filing, responding, paying of annuities, official fees and charges.
- Surveillance of competing technology and patents in the patent literature.
- Take action regarding opposition and infringement of IP rights, including eventually attacking competing patent applications and patents and taking steps against possible infringers.

9.3.8 Choice of IP Attorney

We have been in discussions with two patent attorneys – CURO and Zacco. The latter is Europe's largest and located in all Scandinavia. CURO is relatively small, but well established in Norway, and has a relatively greater share of new patents versus localization of foreign patents than Zacco.

European patent attorneys in general are relatively small, but work through largely the same international networks and with the same authorities. The fees to the patent attorney, and the time one has to spend to give the patent attorney the necessary understanding of the matter, seem to constitute the lion's share of the patenting costs. Decision on patent attorney partner should be based on what we can achieve as to flexible and efficient ways of cooperation, and not on lowest hourly price.

We will strongly recommend that the PRT IP JV have an IP officer largely present in the organisation. In the Phase 2 D&E, the role as IP officer should be carried by a patent attorney employee, who works part-time in the D&E team, but is under the supervision of the patent attorney company.

For the Phase Two D&E, we will go into further negotiations to with CURO AS and Zacco AS to see which of them will help best to implement our IP strategy.

9.4 Why do we think we shall succeed?

The PRT JV is attacking a market that per definition is not possible to estimate. However, we know it is so large that estimates get uninteresting. Also, the contracts will – by nature - be large.

However, there are several factors that make a business model based on PRT for public transport a challenging task. Among them are some of the more problematic characteristics of public transport market:

- Long lead time from need to planning to decisions
- Network economy – i.e. a need for some kind of "protection"
 - Established monopolies
 - Huge entry barriers created by a range of mechanisms
- Often fuzzy decision-making based on political decisions that may be reversed
- Risk averse buyers, and a paradigm shift solution
- The PPP terms resulting from the WTO inspired liberalization is often not known, or not developed

Still we are convinced that we have designed a PRT concept and a business model that should be viable, because time is ripe for public transportation based on state of the art technological solutions - the demand waits to be unleashed.

We think we will have a competitive edge as to

- Strength and variation – in scope, culture, markets, networks and reputations of the companies behind
- A cutting edge concept

- High innovative skills
- Mastering of the creativity enhancing project organisation as well as the structured and more strongly planned project organisation
- High productivity cultures
- Affiliated organisations and companies that may take essential roles in the business development

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