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Model of a High Speed Rail (HSR) Invent Process

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Abstract:

In this article an attempt has been made to develop a model of creating and developing solutions for high speed rail, it´s beam and manufacturing a beam´stechnical problems or both. The invent process is IPR-approach as case study including areas of work-relation strategic management and strategic marketing. The model consists of three cycles of HSR invent: the first cycle of HSR invent includes two IPR stages, the second cycle of HSR includes three IPR stages, the third cycle of HSR includes two IPR stages.Totally seven stages t1….t7/t7 from the beginning of invent idea to the acceptance of patent. The results show that the HSR invent process model present model no exist in the literature and have different construction idea compared to conventional rails supported by embankment. On the basis of existing patent use as platform, strategic management and marketing identifiedplatform as part of solution of HSR problems which have been illustrated in this article and creating three patents.

Keywords: IPR-Rights, Patent, Invent, Strategic Management, Strategic Marketing, High Speed Rail (HSR), Method of Manufacturing beam and beam. Maglev Guidance, Hidden champions (HCs), Industrial Organization (IO), New Trade Theory.

I. INTRODUCTION

The latest developments in the theories of strategic management and strategic marketing are moving towards combining several research methods and frameworks for best adapting their underlying complexity of technology revolution, this being especially due to globalization of product, service and even technology market. Schumpeter's wringsin[22],[23],[24],[25] have been the foundation of national innovation system in German speaking countries. Schumpeter emphasized the unique function of entrepreneurs. By innovating, entrepreneurs challenge the dominant firms through a process of creative destruction, which is the engine of economic and technological progress. The neo-Schumpeterian approach puts emphasis on the impacts of radical innovations although the "destructive" part of creative destruction is not properly understood.

Joseph Schumpeter proposed that an entrepreneur, as innovator, creates profit opportunities by devising a new product, a production process, or a marketing strategy. An entrepreneurial discovery occurs, when an entrepreneur makes the conjecture that a set of resources is not allocated to its best use. Recognition of entrepreneurial opportunities is subjective process, but the market opportunities are objective phenomena. A Schumpeterian entrepreneur is the hero of the drama. He is able to identify opportunities to define a new winning business concept. For an entrepreneur to obtain control over resources in a way that makes the opportunity profitable, his or her conjecture about the accuracy of resource prices must differ from those of resource owners and other potential entrepreneurs. Besides small business owners, management team members in MNCs can be "Schumpeterian entrepreneurs" so far shareholders they are able to identify and utilize market opportunities [14].

Schumpeter did not define what an entrepreneur looks like. Schumpeter defined the functions that an entrepreneur fulfills in an economy. Schumpeter suggestsin [17]:

- An entrepreneurial function is the act of will of the entrepreneur for the introduction of innovation in an economy, and a source of evolution in a whole society.
- Entrepreneurial leadership is the source of creative energy for innovation and evolution.
- Entrepreneurial profit is the temporary monopoly return on the personal activity of the entrepreneur.

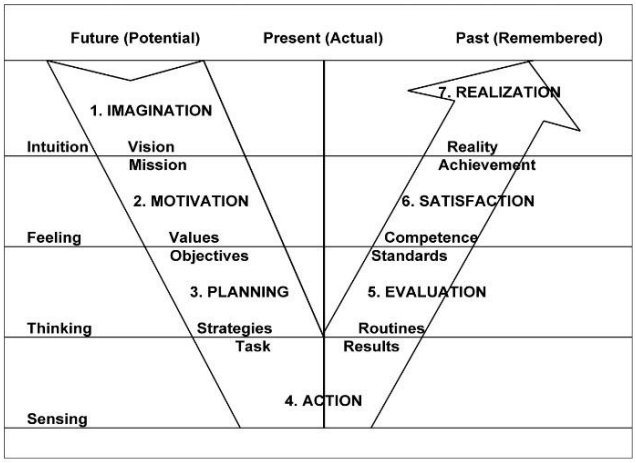

Figure 1: The entrepreneurial decision-making

In order to clarify the mind of the Schumpeterian entrepreneurs, we refer to some writings.

The body of entrepreneurial literature has forgotten the Schumpeterian entrepreneur. The model (Figure 1) that seems to be valid to describe the reality of an innovative entrepreneur is the one developed [10]. They have noticed that a creative management can operate in four levels: Intuition, feeling, thinking and sensing.

According to a Jungian analysis, human behaviour is not due to chance. It is in fact the logical result of a few basic, observable differences in mental functioning. These differences concern the way people prefer to use their minds - the way they perceive or make judgments. There are two ways of perceiving in [9]: (1) Becoming aware of things by sensing; and (2) Indirect perception by intuition. There are two ways of judging: (3) Thinking, a logical process aimed at an impersonal finding; and (4) Feeling, consisting of things that have personal, subjective value. Decisions are predominately made by perception or judgment. In the entrepreneurial decision-making there are many combinations of personal styles since entrepreneurs are in many roles and positions (employer, self-employed, investor, partner, business angel, venture capitalist, gatekeeper, subcontractor, etc.)

Schumpeter redefined the function of entrepreneurs in a society. He believed that an entrepreneur is motivated by the temporary monopoly profit that is the return on the entrepreneur of the innovation that leads to increased productivity and is the fundamental source of wealth in a society in[13],[17]. Innovations are considered as the major driver of an economy.

Schumpeter defined the innovative transformation as a relatively slow and conflict-ridden process and, thereby, distinguished innovation as the function of entrepreneur that is separate from the administrative function of manager in [20]. This reinterpretation helped him outline his theory of business cycles as reflecting the wave-form process of economic evolution. Schumpeter regards technological uncertainty as neither a sufficient nor a necessary determinant of fluctuations but postulates that fluctuations are caused by supply shifts based on uneven technological changes. Schumpeter [23]argued that entrepreneurs create radical innovations in the face of competition. His notion has been generally accepted. In Schumpeter's[23] economic system, business cycles, waves are the major catalyst of economic growth.

Although Schumpeter's [23]theory of business cycles is difficult to apply to the global economy, there is no doubt of the fact that the ongoing technology revolution will impact on the global markets, although we may not know the full implications in [21]. Jensen in [11] made an elegant study of the Schumpeterian dynamics. Comparing the growth of GNP with R&D statistics, Jensen noticed that since the chock of the oil crisis inthe mid 1970sthe growth of R&D expenditures in the industrialized countries has beenapproximately double higher than the growth of GNPs. This trend has accelerated during the two decades of globalization, the 1990s and the 2000s. The revolution of information technology (IT) was the major source of Schumpeterian dynamics in the industrialized countries in the 1990s.The Schumpeterian market chock created new waves of innovative growth firms, anddestroyed the obsolete ones. In the early 90s, Finland was hit by serious crisis in the bank industry and about 20% of the firm population was lost. During the crisis the positive entrepreneurial event was the unexpected global success of Nokia. Two decades later Nokia is in a crisis signaling the new kind of creative destruction of today. In the EU crisis countries (Greece, Italy, Spain, Portugal and Ireland) the Schumpeterian market chock may be in full force. The negative end results are already known by economists. Hopefully, the positive end results are somewhere waiting for the growth boom in the near future.

Table 1: An illustration of the Kondratieff's long-wave theory[12] by Lahti in [15].

Period Description	**Period**	**The key factors of technological change**
First Kondratieff	1780s–1840s	Industrial Revolution: factory production for textiles Cotton
Second Kondratieff	1840s–1890s	Invention of steam power and its application in railways
Third Kondratieff	1890s–1940s	Invention of electricity, steel, etc. and their applications in the process industry
Fifth Kondratieff	1980s -2010s	Digital information techniques, the internet and micro-electronics
Sixth Kondratieff	2010s-???	Nano-engineering and nano-manufacturing

II. THE METHOD FOR HSR INVENT PROCESS

Based on the period (1840s -1890s) of railways etc. above, its need for new technological solutions for railways and steel constructions. In this article the IPR-approach deals with the High Speed Rail (HSR) development process of the area of work-relation strategic management and strategic marketing. New approach means a new point of view to rails when conventional rail constructions or other constructions have weak durability against pressures of high speed trains. There are at least four important technologies which areas arise in this study; 1) Rail embankment technology - its foundation and geotechnical engineering, 2) Steel beam technology - its steel beam tensile properties, 3) Manufacturing technology – its manufacturing method engineering, 4) Automation technology – its instrumentation and control system for method. One important point of view is to look above context outside or inside. Outside means easily ex ante problems if questionnaire is causing false statement. That'swhy method used in this study, is looking essential technical problems of above from the point of view, who is performing development process – it means from the point of view of inventor – and that means inside in [2], [3].

When investigating items 1-4, starting from the year 1995, strategic management and marketing found essential problems in all items, one by one and there was no needed solutions to high speed rail requirements. Rail embankment technology was already overloaded with present lower speed; steel beam technology need new strengths instead of old beam types; manufacturing method technology need new processes; automation need new control systems. Based on above facts, there was no other solution but need of IPR-approach. The main question was, how to found solutions to the problems above 1-4.

Table 2. Sample characteristics in the area of items 1-4

Type of industry	Number
High Speed Train Industry	2
Ship Yards	1
High Rise Building Designer	1
Steel Material Industry	4
Concrete Guideway	1
Maglev Steel Construction Plans	1
Embassy	4
Maglev Factory Planning Company	1
Railway Traffic Service	1
Steel Construction Industry	7
Electrical Equipment Industry	8
Mechanical Industry	5
Machine Industry	3
Tools	4
Steel Bridge Project	2
Rail Embankment Projects	5
Railway Gateway	5
Total	55

Above existing technology and market identification interview (Table 1) included visits, questions and letters about the technology they used and the background on interest of HSRs. Information was analyzedand tested in factories A and B, when considering later our own possibilities to develop capabilities and projects made in the past and based on that to continue development of HSR technology in the near future. This interview was made in the years 1995 -2000. The result was, that above industries don't had knowledges of HSR technology and perceived technical ideas at all. That caused more and deeper investigations of HSR and Maglev Rails made by strategic management and marketing. After founding in reality this technological gap in the industry, it was clear to use own IPR-approach for to develop solution to HSR by using existing patent as platform by Hauta-aho in[3], [4].

In order to find a new integrative viewpoint as solution of above problems, strategic management focused on creating new invent idea by step-wise-approach, using existing patent (claim 1) as the platform. The reason was that listed industries above don't hadidea for a beam structure and manufacturing beam technologies according market need. The result was in this article; in the global market don't exist working HSR technology for to compare our existing patent use as IPR approach:

*A method and apparatus in which separate plate parts are joined automated into a beam comprising: plate parts of a beam place in a storage (1) ready cut to predetermined sizes and in a unloading and cutting unit (2) in coils, from them are transferred automated through an assembly conveyor (3) and press rollers (4) to an assembly unit (5) where the separate plate parts are joined automated together in a continuous process, then transferred through transfer conveyor (6) to a turnover equipment (7) and to an intermediate conveyor (8), to transfer conveyor (9) and to flange alignment station (10) and which steps are operated and controlled automated through an operation equipment (11).*in [4]

Totally during 20 years, it was possible to found seven (7) IPR-stages as step by step solution of HSRtechnical problems. The 7- stages are figured in three life cycles, where IPR stages t1/t7 and t2/t7 establish the first-cycle of HSR invent. The next IPR stages t3/t7, t4/T7, t5/t7 establish the second-cycle of HSR invent, creating the bridge mostly in terms of the technological dimension to next stages. The IPR stages t6/t7 and t7/t7 establish the third-cycle of HSR invent idea. Totally IPR stages t7 – t1 are results of 20 years strategic planning work of entering into a new field and finally to acceptance of patent. During Above period strategic management and marketing could identify that there are critically important differences between High Speed Rail, beam and manufacturing method compared to conventional embankment rails. Those kind of differences are presented in Table 3.

Table 3.The most importance differences between High Speed Rail (HSR)developed in this study and conventional rails.

	The IPR-approach to beam (HSR) and manufacturing method solution	Conventional rails in [1]
Railway	For HSR-beam not embankment needed. HSR -beam can be used for one or more direction between stations.	Including one or more tracks. Track includes ballast with all settlement of rolling ground like

	Saving a lot of cost without embankment material and working hours and construction time	embankment and cuttings, ditch for water outlet and prevent damages of frost and for stabilization of bed of rails and for curry structures of rail. Including all structure of rails.
Rail	HSR -beam don´t need sleepers and following on that a lot of cost savings can be calculated. Also the yearly repairing work minimizes.	Rail includes sleepers, tracks, parts for fastening rails and extension pieces and turn place of rails.
Gauge	HSR-beam allows different gauges.	Gauge 1524 mm width fixed.
Speed of train	HSR-beam structure have very high horizontal and vertical strength and allows very high speed of trains. HSR-beam can be used for maglev speed or less like locomotives.	Every track section have target speed based on rolling stock. Maximum speed is depending on current soil and especially in soft soil circumstances slowly and faster speed variations
Geometry of	HSR-beam manufacturing method follow automatically geometry of railway line in different beam lengths including left/right; up/down curvatures.	Railway measurements only at site.
Positioning of tracks.	Positioning of tracks when manufacturing HSR-beam at factory.	Positioning of tracks on the site with sleepers.
Ballast crushed types	No ballast needed A lot of cost savings by using HSR-beam.	Railway structure is based on stone or gravel use following many of cross section variations.
Strength calculation	HSR-beam strength calculation made by developed program. Strength calculations for every millimeters of HSR-beam sizes.	Based on different soil types. See railway above.
Vibration of trains	HSR-beam structure strength prevent vibration.	See railway and rail above.
Markets	Domestic and export.	Domestic.
Cost of rail	Cost of rail can be calculated based on HSR-beam manufacturing cost at factory per each project.	Not available.

III. THE FIRST-CYCLE OFHSR INVENT

IPR Stage t1/t7

At the beginning of this development work, strategic management and marketing started looking technological requirements printed by Transrapid Milestoneshistory in Germany in [26].

1934- 1977: From the idea to the system decision
1978 -1991: From the test facility to technical readiness for application
1992- 1999: The first application in Germany planned
2000- today: Alternative routes in Germany and abroad.

When calculating value for above guidance production, the technical problem was, how to manufacture guidance economically and technically in general. There was some empirical but manually made suggestions for Transrapid project in Norway and Germany but those could not manufacture needed amount. Capacity and strength of beams could not easily be calculated for continuously different guidance sizes. For example the need was to manufacture 5-6 pieces of guidance a´ 60 meters long in one day production [18]. Also one beam could vary in horizontal radius (minimum 350 m; maximum ∞) and vertical radius (530 m; maximum ∞). Also those requirements could be possible appear in one guidance. Strategic management could identify many critical problems in guidance and in when manufacturing those idea of guidance as in [16].

We were able to find out that, based on among other things Transrapid Milestone in[26] founding and designed drawings between Berlin and Hamburg [18], that there was question of missing technology. There was in question of beams which could not manufacture following needed technical requirements of HSR. In this stage strategic management could identify that there was technological barriers to manufacture manually made beams and capacity could not be calculated reliable. Based on that facts, in the IPR stage t1/t7, we could not calculate value of HSR production for new customer. Only what we had, was information on production capacity requirements andcalculations according drawings, how much it cost to manufacture manually made beams from Berlin to Hamburg or according calculations made by our factories. Based on the Milestones planning on June 1997, time construction of guideway planned to period 1999-2003. Have to note that it was a question of manually made guidance. Time calculations showed period anyway impossible to reach and time was not realistic. For strategic management and marketing,this time was strategic point to start and call to developmentnew invent idea for HSR.

IPR Stage t2/t7

IPR stage t2/t7 started when strategic management could see two main technical problems Those were: 1) guidance (later beams), could be understood designed by old manually made beams but also 2) based on old manufacturing technology. In the IPR stage t2/t7 strategic management have to find solutions for above two problems. After analyzing problems, strategic management could understand the importance of only invent solutions. Working with new invent vision came more near in reality to reach stage by stage.

Also there was problems in: 1) maximum speed of trains, 2) strengths of soils and especially in soft soils and 3) and depending on that 3) costs of embankment. There are some historical calculations based on foundation engineering and need ground plans, many lay-outs for different bedding, ground water lowering, bottom overhand benching or in general large soil explorations etc. Strength calculation for conventional rails over embankment had in literature too many variables to manage when train speed is higher than maximum. Those was the main problems in existing field and in the IPR stage t2/t7.

In this IPR stage strategic management got clear solution at the factory environment of new beam structurehave to be and also how to manufacture that beam. This we call in this study as unique invention of HSR and manufacturing method [19]. Solution by strategic management was based in the year 1999 to many tests of patent manufacturing method presented earlier (claim 1). One technically important platform suggestion was printed in patent and offered the solution to go over critical beam assembly problems. Using existing patent as platform.it was clear to use more patent as platform in empirical tests as follows:

An invented method and apparatus allow a fast presetting of the apparatus when the size and the profile of the beam need to be changed. Every adjustment of the apparatus, which is partly determined by the size and profile of a beam, can be performed at a centralized control panel of a control unit. in [4].

By using patent platform as part of invent method, strategic management could calculate now strength of a beam and analyze preliminary calculations in axis x – y – z. Calculations identified value z, which could be solution for conventional rail and maglev guidance problems. In the companies A and B tested beams and manufacturing methods had to make by using scaled beams and manufacturing of scaled beams. In the IPR stage t2/t7, we used different technical calculations to develop beam structure alternatives and also to perform different parameters of beams and needed manufacturing methods for to identify contributory factors for solutions. Solutions for conventional rails and maglev beams as HSR-beam solutions could be recognized by strategic management and marketing near each other, creating technological synergy effect.

IV. THE SECOND-CYCLE OF HSR INVENT

IPR Stage t3 /t7

The effort level in this stage t3 increases from t2. But have to note, that also negative results belongs to development work but can give positive support. For to compare Berlin-Hamburg Maglevmanual manufacturing to present patent beam manufacturing capacity, could be identified important differences. In the company A strategic management could calculate and analyze labor cost differences, when manufacturing beams manually and compared to automatically made parts of beam structures. When investigating work numbers, could be analyzed that beams manufactured manually by men work, capacity was only 1.8 meters of beam / hour. Compared to platform method, average capacity of same kind of beams could be analyzed approximately to 17 meters of beam / hour. That means big difference in costs and support automation use, when manufacturing more economically HSR´s. That kind of information supported many negative feedbacks. When manufacturing by automated equipment different specifications like variable beam heights, welding methods, weld sizes, test drives point one line output. Results in the company A supportedmore and more patent platform use when developing method in the company B, too when r manufacture different structures of beams. Because of that company B followed in developing scaled parts of manufacturing method claims 3 and 4:

The apparatus comprising: an assembly conveyor (3) and press rollers (4) which can handle simultaneously three or four separate plate parts of which a beam will be produced, in[4]

The apparatus comprising: one or two assembly units (5), which can have beam moving rollers equipped with regulators to adjust speed, plate parts supported by automatically adjustable rollers, equipment to join the seams of the plate parts, which equipment can be welding equipment, and automatically adjustable rollers which increase the strength of the beam and which enable an optimization of the qualities of the beam, in [4].

Strategic management focus criterion for development more narrow as objects and could analyze them in detail. This was important because of getting measurement data of technical threshold values and to look objects from the invent idea viewpoint. In this Stage t3/t7 strategic management concentrate his attention in making decision of different detailed objects to reach patent by new invent idea and use of IPR experience in developing HSR solution. There was to work with many present platform suppliers of mechanical engineering, automation, *e*-factory possibilities, consulting engineers, universities, research laboratories, steel mills, ship yards, steel constructors, patent examiners, cooperation companies in foreign countries etc. Invent idea technology could be developed on present patent platform and founded successful. Results creates possibilities to design product patent, manufacturing method patent and manufacturing system patent. Totally three new technologies of new invent ideas could be solutions for HSR technology problems.

IPR Stage t4/t7

Strategic management now could see product idea structure in creating the technical basis for strength calculations in every single HSR product in spite of horizontal and vertical shapes but also in spite of sizes. Enclosed used platform of patent (claim 5):

*An alignment unit of the apparatus comprising: self-adjusting and adjustable rollers for inspection and calibration of the profile of a beam,*in [4].

After above step by step development work empirically test by test at factories, preliminary manufacturing process could be considered. Results was that HSR beam manufacturing could be divided in following working phases: a) non-symmetrical invent beam structure parameters, b) non-symmetrical beam manufacturing invent control, c) stiffeners assembly, d) both side plates manufacturing invent control e) stators assembly f) side plates welding, g) total length beam assembly and measurement of horizontal and vertical radius and invent system control. Manufacturing method create preliminary the novelty in reaching parameters and beam tolerances, technical effect criterion of HSR and claims for method. For new manufacturing method system strategic management could found strategic components for making measurements of parameters empirically in a factory circumstances and in that way create the novelty in reaching industrial criterion. In this stage when making observations in factories A and B of scaled beam shapes and sizes, could be found problems when manufacturing box beams. Beam need to be bended to the tolerances. That problem was the same like in the shipyards when manufacturing T-beams. After that strategic management decided to consider new idea for to control energy input. Observations made by present patent (claim 5) was creating new invent idea in manufacturing HSR beams. Control of energy input data after that founding was tested successful.

After all and based on data created by platform, new requirements for novelty founded more clear and strategic management and marketing in group company A decided to hold observations of processes as business secret until the date of patent application and not allow any other group to enter into this particular aspect to work. The same according mission and vision statements for new business idea and market entry plans to new industry.

IPR Stage t5 /t7

In the Stage t5/t7 developed technical solutions to the HSR problems include individual parts for HSR invent products for to reach cost advantages compared to constructions made on site manually. For product invent manufacturing method also is need of new technology components for working automated etc. That´s mean importance connection to claim 1 above:

.....steps are operated and controlled automated through an operation equipment, in[4].

This logic platform technology had capability to control preliminary when manufacturing of HSR products, used methods and systems presented in the table 3.This kind of technology is important in all knowledge levels 1, 2 and 3.

Table 3. Observations of processes in three knowledge level of IPR stage t5/t7.

Process	Knowledge Level 1	Knowledge Level 2	Knowledge Level 3
Solutions of HSR products invention and finding technology edges	HSR new structure better strengths (horizontal axis z-z) advantages and saving in costs as technical formulas can calculate in tables. For HSR solution automation needed. Factory A.	Analyzing mission and vision statements for the HSR business strategy by level 1.calculations weekly at the factory A.	Market entry strategy planning for the new HSR product industry. Yearly.
Solutions of HSR manufacturing method invention and finding technology edges	HSR´s automated manufacturing methods for products structures developed. Automation can handle very large sizes of HSR products designed for requirements of high capacity. 5-6 pieces of HSR beams possibilities for HSR factory.Factory B.	Analyzing mission and vision statements for the HSR business strategy by level 1 calculations weekly at the factory B.	Market entry strategy planning for the new HSR product manufacturing method industry. Yearly.
Solutions of HSR manufacturing method system invention and finding technology edges	HSR´s automated manufacturing method systems for controlling manufacturing data and product structure parameters Factory B /automated operation equipment logic.	Analyzing mission and vision statements for the HSR business strategy by level 1 calculations weekly at the factory B.	Market entry strategy planning for the new HSR product manufacturing method system industry. Later development steps.

Decision making	Based on invent data founding during step by step analyze. Factories A and B.	Decisions to hold new business ideas as business secret. Factories A and B.	Decisions to hold market entry planning as business secret. factories A and B.

In the stage t5/t7 advantages for new HSR beam structure capacity could be made also when investigating weak soils in one country for high speed trains (HST) and to reach regulations and standards (knowledge level 1). According strategic management IPR experiences in earlier stages, it was critically important to found invent products solution. High speed train speed demand special requirements of product strength especially against vibration (technically axis z-z). This can one found in reality when HST reach higher speed and train start to move like snake. This is the reason of problems in embankment. The higher speed, the more horizontal transfer of train. Because of that phenomenon, HSR strength need to be calculated as vibratory strength. This seems to be big problem globally (knowledge levels 2 and 3). In this study developed HSR- product invent idea, have large capability against vibration which can be calculated by developed program. This strength can be calculated mathematically for beam diameters millimeter by millimeter, inch by inch etc. As the result in this step t5, one beam dimension mentioned Berlin-Hamburg[18]in the beginning of this study, can be now calculated as following formula [7]:

1. HSDA – H x d1/α/d2 – T1 x B1/T2 x B2 – L
2. HSDQ – H x d1/d2 – T1 x B1/T2 x B2 – L

Where,

HSDQ and HSDA are a beam invent structures and

H = total height of the web B1 = width of the top flange

d1 = thickness of the edge plate B2 = width of the bottom flange

d2 = thickness of the middle plate T1 = thickness of the top flange

α1, α 2 = angle between websT2 = thickness of the bottom flange

L = length of beam

Based on the special need of HSR in one country, manufacturing capacity calculations are easy to plan for beam production and for one factory capacity requirements. One important result isthat beam structure is computable for programmed HSR beam strength parameters. Following that example between Berlin – Hamburg planned guidance as HSDA, HSDQ types,can be calculated in few seconds. That means cost savings in designing HSR. And more over technical variations of beams – not only standards like straight beams but beams up/down; left/right, can be designed in every single millimeter of structureand in that way saving a lot of design, working hours and material cost etc.. Same regarding cost savings when using 60 meters long span for to substitute conventional and expensive rail embankment in[6],[7].

V. THE THIRD-CYCLE OF HSR INVENT

IPR Stage t6/t7

Based on the above results of development, strategic management and marketing considers period to send patent applications. Decisions of timing are depending on the readiness of technological solution readiness. Strategic management decide in this stage t6I, to send product invent idea to IPR office to evaluate. Tasks them includes objective investigation of product invent idea novelty and later investigations of manufacturing method idea and manufacturing system idea. After preliminary investigations, the results was: three possible patents could be possible. This kind of objective and positive information helped strategic management and marketinggo forward. Knowledge levelincreased when the visions seems to be achievable from knowledge level 2 to level 3 and visible

In the stage t6, strategic management decide to delivery results of development to IPR office but only to hold novelties as business secrets until the date of patent application [19]. This decision coordinates the jobs of strategic management and strategic marketing. Coordination of jobs are important in timing to make patent application and the date of that. For this purpose have to identify demand in markets, have to identify threats and possibilities for to react, have to be ready to take back applications and consider to change timing etc. Those belongs to timing of IPR- approach in this study. After that analyze, strategic management decide patent application and mission, vision and plan of market entry. Patent is main goal as mentioned in early stages and includes three invent ideas and three patent applications.

IPR- Stage t7/t7

The main goal in this study was to develop patents for solutions of HSR problems. For this purpose, strategic management could identify during IPR stages t1-t6, three possible novelties and then three possible patents, in one invent idea. These are important results and formula of cost saving IPR-approach to HSR problems. Because of identified synergy effect, strategic management got to know empiricallythat new inventions for next generation patents are importance results of patent strategy, when used in stages existing patent as platform. Synergy results supported mission and vision based on stages as follows: one invent idea created 1) three products, 2) three manufacturing methods and 3) three manufacturing systems. Each of the three major technological solutions can be focused in to each customer groups and their functions [6],[7]. In this article one of the key customer group is High Speed Rail customers. The object of the invention was to develop a beam, a method for manufacturing a beam, and an apparatus implementing the method in such a manner than the mentioned problems are solved. The object of the invention is achieved by a method and system which are characterized by what is disclosed in the independent claims. Preferred embodiments of the invention are disclosed in the dependent claims. The invention is based on the fact that the heat input used in manufacturing the beam

is controlled and monitored centrally and, thus, the manufacturing tolerances are achieved by the method and apparatus of the invention and its preferred embodiments.

The method and system of the invention provides the advantage that are possible to manufacture during manufacturing process automatically a dimensionally accurate beam according to the specification, that is, a final product complying with the manufacturing tolerances. On the basis of the summary of the development above, this study includes model which includes three alternative invention (Figure 4).

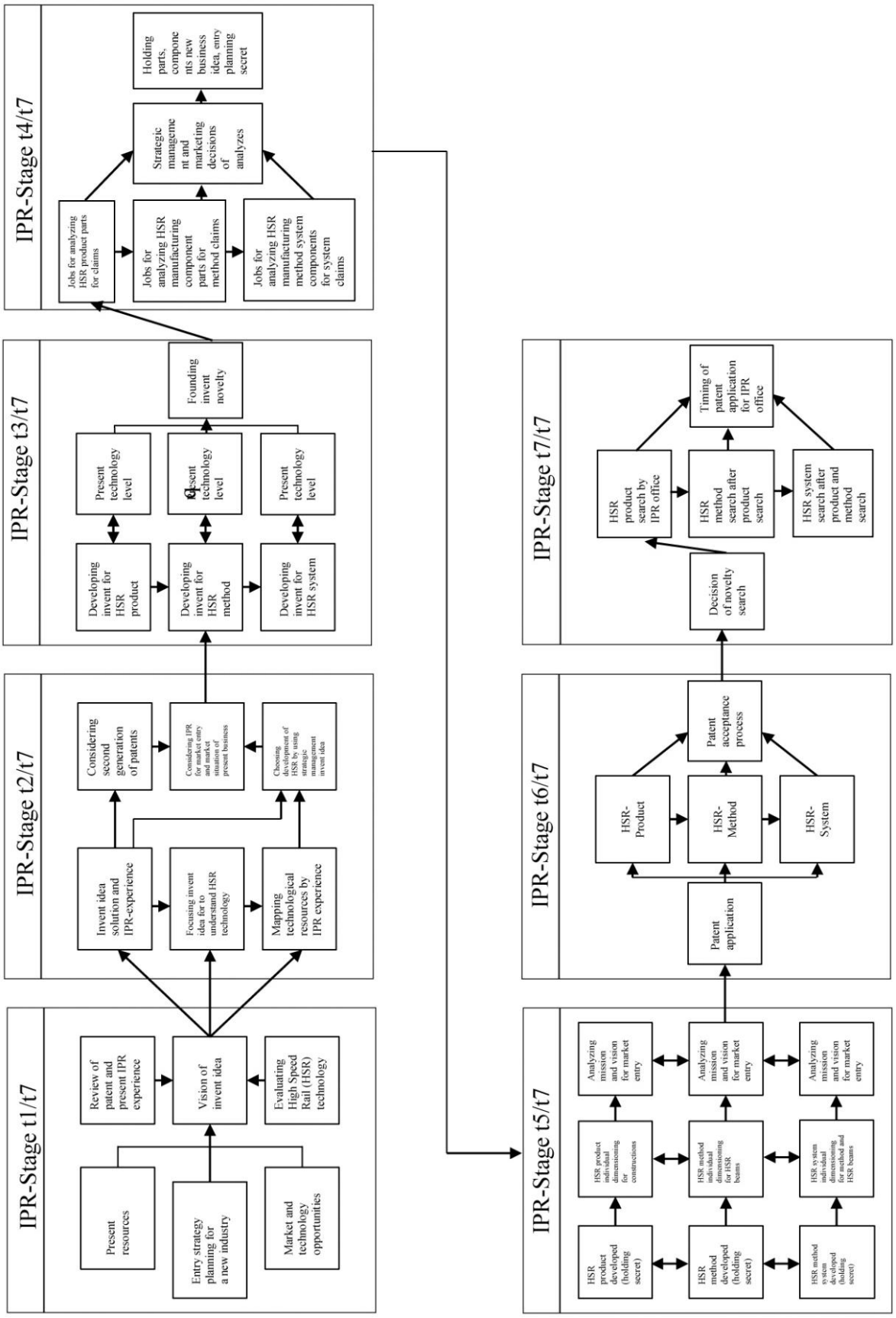

Figure 4. Model of a High Speed Rail (HSR) invent process

VI. CONCLUSION

In this article aims at showing that the IPR-approach of High Speed Rail can be seen to include seven different IPR-stages. This kind of approach is new and is based on invent and area of work-relation strategic management and marketing. The different stages include forty-three factors which have been developed on the basis of literature dealing with empirical tests in the factory environments between years 1995 – 2009for patent application. The results was at least three invent products, three invent manufacturing method and three invent manufacturing system for High Speed Rail problems identified in the IPR-stage t1/t7. Development period to t7/t7 was very long taking time about 20 years. But every invent process is unique, with its own specific features, and these can fundamentally influence the flow of the stages of IPR approach and individual entry itself. Therefore, it is not possible to draw exact conclusions from this research as to solving the problems of the invent process in detail. But, however, offer a new way of thinking invent as area of work-relation strategic management and marketing. Based on that the model in this article offers established companies an alternative to develop the company for the future challenges, especially in the situation in which the company is at a successful stage in its present field of activity.

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