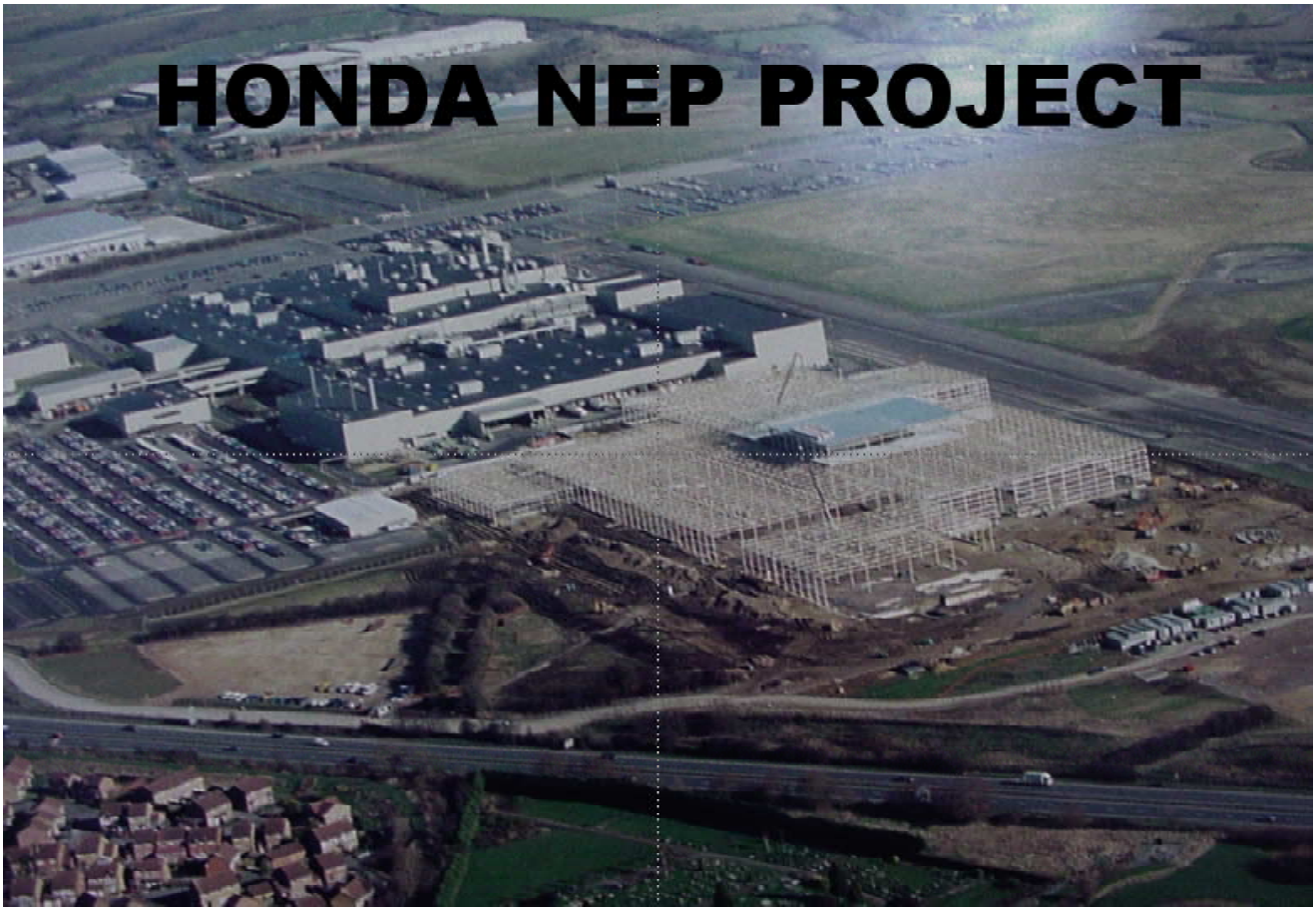

CONSTRUCTION OF NEW EUROPEAN CAR PLANT AT SWINDON FOR HONDA OF THE UK (MANUFACTURING) LTD

DTI FUNDED FAST TRACK PROJECT

(REF FT5-BAY01)

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1 Synopsis

1.1 Central Question.

1.1.1 Honda is one of a growing number of Client organisations, which successfully uses so called "sophisticated" project management tools and techniques. The end result is a number of projects, which have beaten tight financial constraints; and have been delivered on time to the required quality. Indeed Honda's internal benchmarking has shown that construction costs on many projects are comparable with those in the competitive USA market.

1.1.2 On the NEP Project, Honda's Construction Managers confirmed that construction costs achieved were on, comparable situations, below what is being achieved in the USA.

1.1.3 This aim of this report is essentially to answer the question, "There are many good tools out there but most people don't use them – why?"

1.2 Appraisal Panel Comments

1.2.1 The Appraisal Panel hope that this work will shed some light on why it made commercial sense for Honda to use the best tools and procedures and in so doing persuade other clients and constructors to emulate Honda.

1.3 Why read this report?

1.3.1 In September 2001 Honda completed a £130M investment at Swindon. This was for a second 50,000 M2 Car Plant adjacent to the existing Car Plant at Swindon. The construction performance was impressive. Building costs including design came in at just over £35M, equivalent to £701 per M2.

1.3.2 This key performance indicator of £701 per M2 should be set into context by comparison with the adjusted cost of £1173[1] per M2 for an almost identical plant built between 1988 and 1992 on the same site at Swindon.

1.3.3 Moreover, initial cost estimates in 1998 from many leading UK and Japanese companies came in a range of £800 - £1,000 per M2.

1.3.4 As Honda builds similar buildings around the World it is able to benchmark its construction costs in the same way as it does its car production costs. Currently the UK operation is achieving construction costs comparable with those in the USA. This is particularly important because the USA construction market has long been held up as one of the most efficient in the World.

1.3.5 In summary, Honda has achieved a 40% improvement in its UK construction performance over 11 years (as measured by building cost for buildings of equivalent functionality). This improvement is well above the 30% improvement suggested by Sir Michael Latham in 1994 within his landmark report[2] on the underperformance of the UK construction industry. The 30% improvement suggested by Sir Michael was widely criticised at the time as being impossible and indeed there are many who still doubt that such an improvement is possible.

1.3.6 What is more important is that this improvement has not been at the cost of cutting building functionality, nor has it been at the cost of Contractor (Supplier) margins. Honda recognises that the only way it can survive long term is through its Suppliers being profitable.

1.3.7 In Honda's case the improvement has largely been achieved by using the best available management tools and techniques coupled with a company philosophy, which actively encourages change and challenges the status quo.

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[1] £837 per M2 in 1990 adjusted to £1173M2 for equivalent price in 2001

[2] Constructing the Team (1994) – Sir Michael Latham

1.3.8 This meant that the recently completed car plant (2) was achieved under a different procurement route and with a different contractual regime from the original plant (1). Moreover Honda's own role as Client changed between the two comparable projects, in particular on Car Plant 2 it saw itself as central player within a "One Team One Goal" philosophy

1.3.9 This significant improvement in out turn cost between the two projects certainly provides justification for Honda's decision to use the many good management tools now available. However the aim of this report is also to ask why "most people don't use them?"

1.4 Honda's understanding of the Construction Client Role

1.4.1 Honda recognises that the Client's role is central to the success of the Project.

1.4.2 Honda through its automotive business recognises that it is important within any business operation, to get close to the supply chain.

1.4.3 Honda understands that in all areas of its business there are risks. Its strategy is therefore about risk management not risk avoidance.

1.5 Hypothesis

1.5.1 Honda has clear business objectives, which in turn translate into business strategy.

1.5.2 The business objectives comprise being a global brand synonymous with quality.

1.5.3 However, part of the business strategy necessary to achieve these objectives is to create a culture, which encourages "thinking the unthinkable and challenging the status quo".

1.5.4 The achievement of Honda is that it manages the paradox created by risk. On the one hand it creates a culture in which risk taking is encouraged, on the other it recognises that risk taking should not be reckless, but rather it should be managed.

1.5.5 The importance of culture and risk should not be understated.

1.5.6 If the organisational culture does not allow "risk taking", which by definition must include change, then however good the alternative new methods are, they will not be adopted.

1.5.7 In the commercial world it is often the case that conservative businesses are forced to take risks and to change because of changes in the market, which mean that failure to do so will prejudice their survival. In fact, many businesses, which fail, do so after eventually recognising the need to change too late in the day to ensure survival.

1.5.8 In the non–commercial world there are not the same pressures of the market place to prompt change.

1.5.9 The Authors take the view that in many organisations there is considerable "inertia" which acts as an "obstacle" to change – no matter how attractive the alternatives might be.

1.5.10 The thesis of this report is that long-term success in construction projects is no different to long-term success in business as a whole. However the key is a culture which allows, indeed even requires, risk taking and change, but in a structured rather than reckless or foolhardy manner.

1.6 Honda Philosophy

"Life is measured by the number of times your soul is deeply stirred" - Soichiro Honda

1.6.1 Honda is a multi million pound global business. Honda is also a "people driven", philosophy based company. Honda's philosophy is summed up by: "Through challenge, fresh ideas, a young attitude (i.e. young in spirit) teamwork and a friendly working environment we will achieve all we set out to

accomplish".

1.6.2 "Advancement, Challenge, Quality & Partnership" also describe Honda's philosophy. Further information concerning the Honda "philosophy" is found at Appendix 1.

1.6.3 It is the Authors' view that the Honda philosophy is the key to the construction project success. The philosophy creates a culture in which it is appropriate to challenge the status quo; indeed the company encourages "creative dissatisfaction". This means that every assumption or application within the automotive sector of the business is challenged regularly.

1.6.4 It is the drivers (philosophy and culture) of the business, which are the key.

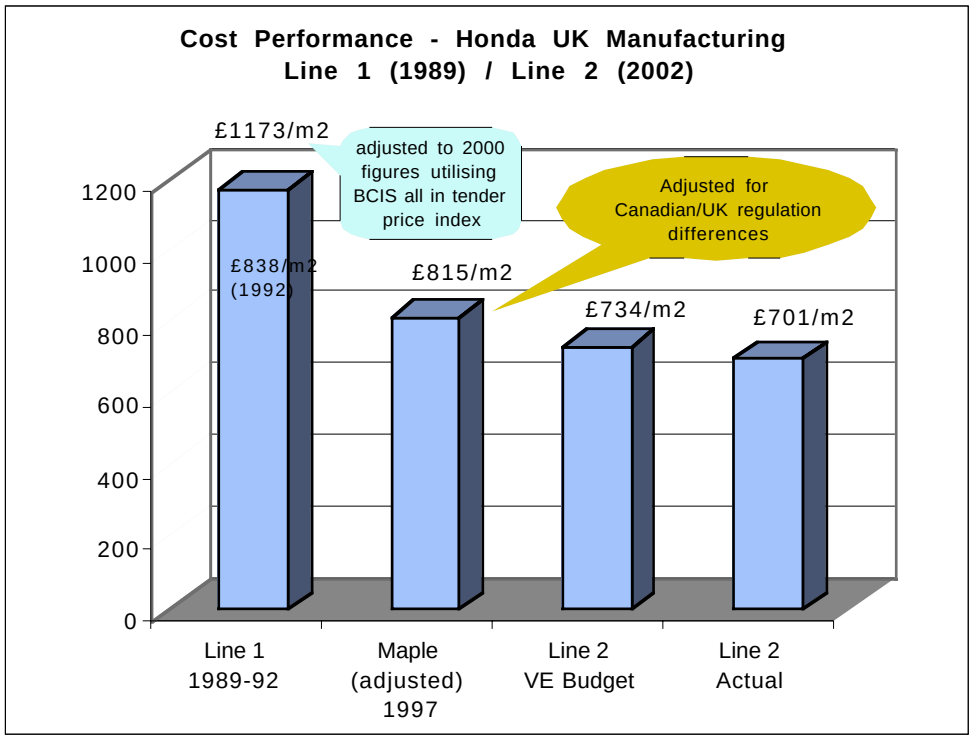
2 Background Information

2.1 Honda's New European Plant (NEP Project).

2.1.1 Honda has invested £1.5 billion at its Swindon manufacturing plant since coming to the UK in 1985, of which approximately £130 Million has been invested between 1999 and 2001 on the construction and fit out of Car Plant 2 (NEP) at Swindon.

2.1.2 The New European Plant (NEP) Project was successfully completed at the beginning of July 2001 to enable trial car production to commence immediately. Full single shift production in the new plant commenced in September 2002.

2.1.3 The project has been a considerable financial success having been brought in within budget and indeed at a lower cost (£701 per M2) than the original value engineered budget of £734 per M2. Further performance criteria is found at Appendix 2.



2.1.4 The NEP Project contrasts with the construction industry's general under performance on major projects.

2.2 Scope of Project.

2.2.1 An external view of the building may convey the misleading impression that the project simply involves the construction of a large "warehouse" type structure.

2.2.2 The reality is that there are huge trenches (large enough to include a car, personnel and machinery) running the length (400 m) and breadth (125 m) of the building. There are also deep pits, mezzanine floors and a basement for the Paint Shop area. These accommodate many different processes, machines and robots many of which are highly sophisticated.

2.2.3 The services are highly complex and provide the power and environment for the car production process as well as for the people working inside the building.

2.2.4 Thus the project comprised a combination of heavy civil engineering involving deep excavations; steel sheet piling, bored concrete piling, heavy reinforced concrete foundations, a steel frame with hanging conveyor plant and extensive infrastructure works. The infrastructure works involved external public highways, new gas, water and electricity supplies and on site wastewater treatment facilities. The work also comprised a complex array of Mechanical, Electrical and Process Services and Machinery. This covered M & E building services and the installation and co-ordination of all the manufacturing equipment from conveyors to paint booths and robotic machinery.

2.2.5 The challenge of the project was the co-ordination of numerous parallel activities on a fast track programme whilst achieving the flexibility of finalising many automotive processes and robotic installations until the latest possible time in the project cycle.

2.3 Comparison between car industry and construction

2.3.1 The car industry has often been cited in the debate over construction performance, the proposition essentially being that "performance of the car industry has been turned around over the last 20 years, why cannot construction do the same?"

2.3.2 Honda has taken that advice literally and adopted and adapted many of its processes and methodologies emanating from the automotive industry and applied them to construction.

2.3.3 In particular Honda's innovative approach to automation is reflected in its approach to construction. For example a Canadian Construction Manager who had never previously worked in the UK was after careful consideration appointed to manage the NEP Project, a decision unlikely to have been made in many other UK organisations. This appointment was critical and yet it breaks with current orthodoxy. It was a decision however, which is entirely consistent with a culture whose core value is "never accept the status quo".

2.3.4 Another example of a novel practice was the training in Total Quality Management (TQM) – at Honda's behest – of key trade contractors prior to the NEP Project commencing.

2.4 UK Construction Performance

2.4.1 UK Construction is a huge sector within the economy and accounts for approximately 8% of GDP. However, generally construction has a poor track record for both small and large projects alike. The larger project failures are often well documented both in the press and in project audit reports commissioned by private Clients and the Government alike. For example, the public accounts committee[3] investigating a 72% baseline budget increase on the Trident programme concluded there was evidence of "mismanagement on a grand scale". This kind of performance is not unique: figures in the technical press suggest the final Jubilee Line out turn cost will be around £3 billion as against a £1 billion budget.

2.4.2 There is evidence of the emergence of a group of more enlightened Client organisations that generally achieve a better performance from the construction industry on their projects[4] than the average. Honda has been one of those enlightened organisations from the outset, though its activities rarely feature in the press. This project is an opportunity to capture and share in the many good practices of one of the world's pre-eminent engineering businesses.

3 Committee of Public Accounts Twenty Sixth Report on "Ministry of Defence: Management of the Trident Works Programme" (1995)

4 "Construction Procurement by Government" – The Levene Report (1995)

2.4.3 It is apposite to refer to the Egan report[5] at this juncture: "The Task Force is strongly of the view that there is nothing exceptional about what major clients are doing to improve performance in construction. Anybody can do it, given the time, the commitment and the resources".

2.4.4 The construction industry has had available to it for some time several authoritative publications describing how to improve performance and successfully manage construction projects. This includes documents such as the procurement guidance notes produced by the Audit Commission[6], Treasury[7] as well as those produced by the leading professional organisations (ICE, RICS, RIBA, CIOB etc). There are also whole systems such as "PRINCE" (Projects in controlled environments). However despite good material, the reality of UK construction is that few of the recommended professional management techniques and systems are widely adopted.

2.4.5 Honda by contrast has been able to implement – and benefit from – many of the widely recommended techniques and systems and also to develop some of its own methods. This begs the question once more – why did Honda use these methods?

2.5 Methodology

2.5.1 The authors have prepared this report following internal performance reviews.

2.5.2 The authors have also held interviews with key personnel representing all participants within the Project (both internal within Honda and external organisations including Designers, Contractors, Solicitors and Insurers). A full list of project participants is found at Appendix 3.

3 Key Findings

3.1 Summary

3.1.1 During discussion and interviews with the project participants a number of factors came up repeatedly. These were:

3.1.2 Honda placed particular emphasis and effort on identifying its corporate objectives and then developing a strategy to achieve these objectives.

3.1.3 Honda considered that the only way to secure work within tight financial restraints and to achieve flexibility of design until late into the Construction programme was to use "Construction Management" as the method for procuring the works. This was seen as an enlightened approach, which few Client organisations would be prepared to take.

3.1.4 Honda put considerable emphasis on Construction Manager selection for the project. It was of paramount importance to select the right team of people with the right attitude who could buy into a "One Team One Goal" approach.

3.1.5 Honda established very effective communications systems within the project.

3.1.6 Honda established a culture of transparency in which problems and issues were not held back but rather they were managed in a pro-active manner as soon as they became visible. There was no attempt to create a "blame culture"

3.1.7 Honda pre-empts and is pro-active, there is a strong emphasis upon planning at all stages of their projects

3.1.8 The Honda culture encourages the questioning of established procedures ("Why?" is a word which is frequently used at meetings, but in a positive pro-active context). Many meetings are arranged to

5 Rethinking Construction (DETR, 1998) "The Egan Report"

6 Audit Commission (1996):- Just Capital; Local authority management of capital projects

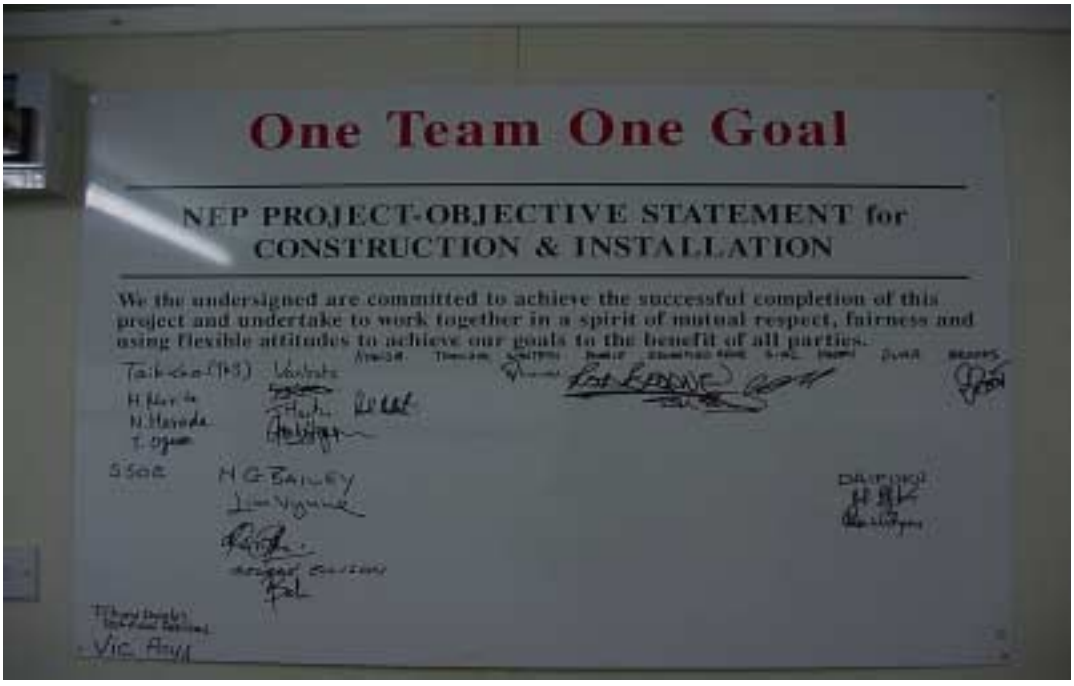
7 Treasury:- CPU Guidance Note No 41: Managing Risks and Contingency for Works Projects

pre-empt future problems.

3.1.9 Honda contracts are drafted to be as "fair" and transparent as possible, generally seeking to place the risk with the party best suited to managing that risk.

3.1.10 Effective conflict resolution is seen as a necessary part of the project arrangement. In practical terms this means that all issues are brought out into the open as soon as possible. It also meant that regular meetings at Director level were held with the project

3.1.11 Honda sought to establish a team approach at all stages of the project. Indeed Honda was aware that the only way the project would be successful would be if everyone bought into the "one team one goal" philosophy.



PROJECT CHARTER: - We the undersigned are committed to achieve the successful completion of the project and undertake to work together in a spirit of mutual respect, fairness and using flexible attitudes to achieve our goals to the benefit all parties.

i. e. "One team One Goal" Not "two teams own goal"

3.2 Client involvement

3.2.1 All project participants agreed that Honda is much more actively involved in its projects than most other Clients. For example Tony Damon of SSOE (USA based Designers) stated:

3.2.1.1

3.2.1.2 I find that Honda, as an organisation, has been more personally involved in their projects than most clients. This is not to say they are micro-managers, but rather, well-informed, knowledgeable and experienced owners, who know what they want. They take a personal interest in the project and its success. Honda has been excellent at setting forth the vision and goals of the project at the beginning of the project; setting the strategy of how we would achieve the goals; and then personally participating in the tactics to follow through on the strategy. They assured that these goals were communicated to all members of the project team (designer, construction manager and contractors). Honda worked with the designer and construction manager to establish the key measures of success and then followed through with monitoring progress toward the goals throughout the project.

3.2.2 Steve Snow of Severfield Reeve (Steelwork Contractor) stated:

3.2.2.1 "The construction knowledge of Honda played a large part in the project's success."

3.3 Client differences

3.3.1 What sets Honda apart from the others?

3.3.2 Paul Watchman of Freshfields (Solicitors) stated:

3.3.2.1 What sets Honda apart is their culture of testing the existing procedure or orthodoxy. They do not accept the status quo. On occasions they will test to the limit in the way that a car component might be tested. However their approach is not confrontational and they are willing to treat advisors and suppliers as part of a team. Their culture is pro-active and pre-emptive rather than negative, sometimes there is "creative tension" within meetings reflecting a deep will to succeed. However there is not the fear of making mistakes that is found in some organisations.

3.3.3 Tony Damon of SSOE (Designers) stated:

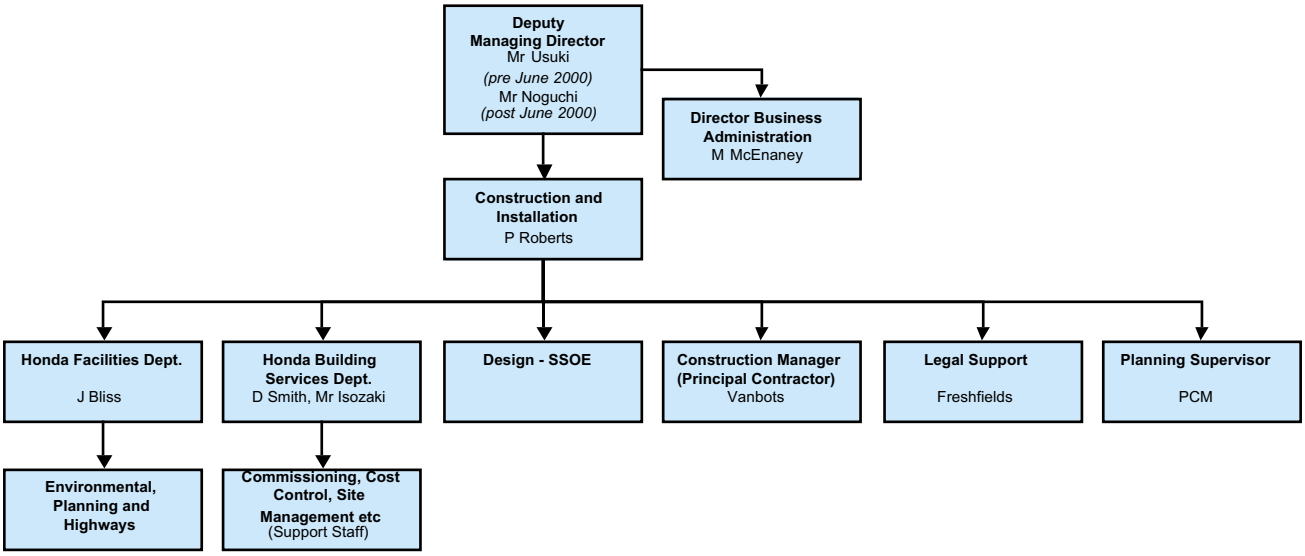
3.3.3.1 "What sets Honda apart is their understanding of what it takes to build a true project team (i.e. have a vision; select the right team; involve the team in the planning (strategy); receive commitment from the team members; communicate the vision and goals to all involved (drive it down); treat the team members professionally and fairly."

3.3.4 Paul Rothera of Rothera Goodwin Chartered Architects stated:

3.3.4.1 "Honda are not preoccupied with headline statements or preconceptions about what they ought to be doing or saying. As a result of the above, Honda are prepared to consider what appear sometimes to be slightly out of the ordinary or off the mark approaches to solutions. In general the above attitudes run right through the Clients organisation.

3.4 NEP Organisation Chart

3.4.1 The NEP organisation structure follows below. As mentioned earlier, a full list of all project participants is found at Appendix 3. The key feature of this chart is that Honda effectively acts as both Client and Project Manager but utilizes considerable external support in areas where it recognises it lacks expertise and/or resource.



3.5 Construction Management

3.5.1 Honda recognised that whilst there is a perception in some quarters of higher risk using Construction Management as a form of procurement, there is also the potential for gain as the Client takes on board risks which main Contractors would otherwise need to price.

3.5.2 Honda's skill is in effectively managing these potential risks using a pro-active and pre-empting management style in order that their impact (if they materialise) is kept to a minimum.

3.6 Construction Manager Appointment

3.6.1 Honda's strategy was to appoint the Construction Manager as soon as possible in order that he would be able to work with the design team and make a significant input into the design process from the perspective of value engineering and buildability.

3.6.2 The appointment of the Construction Manager (CM) involved an innovative selection process.

3.6.3 14 leading Construction Management organisations from the UK and overseas (including Japan) were first invited to offer an expression of interest in the Project. The enquiry process was carried out at a distance and Honda's name deliberately kept off this initial enquiry.

3.6.4 As a result of the initial response 10 organisations were invited to tender their CM services and provide a programme and costing for a "dummy building". The dummy building was in fact a car plant, which had been constructed some years earlier. However by taking this somewhat innovative approach the initial thoughts of the Construction Managers could be obtained without waiting for the design to be at a stage when initial enquiries normally went out.

3.6.5 A shortlist of 6 organisations was then invited for a 45 minute interview at which each Construction Manager (CM) was invited to make a presentation. Honda's interview panel comprised representatives of its own in house business and construction team, the designers (SSOE of USA) and seconded Consultants working as part of Honda's team on other projects at that time.

3.6.6 The format of the interview comprised 30 minutes for each CM to explain their background and experience of similar projects. There was then a 15 minute session of structured questions at which Honda sought to evaluate the ability of the proposed CM team to achieve the overall project requirements and to measure their attitudes in respect of "teamwork, cost control, flexibility and company management structure".

3.6.7 After these interviews a shortlist of 3 CM organisations was put forward for a more rigorous final

selection appraisal involving a 2 – 3 hour interview by the same interview panel.

3.6.8 The final interview was preceded by the development of a questionnaire, which was used as the template for each interview. The questionnaire was used to evaluate each CM organisation under the headings of "Quality, Cost, Delivery, Management, Safety and Environment" (i.e. QCDMSE). The weightings under these headings were agreed by the Panel prior to the interviews. A further category was introduced of Construction Manager Fees. The final order of weightings was as follows:

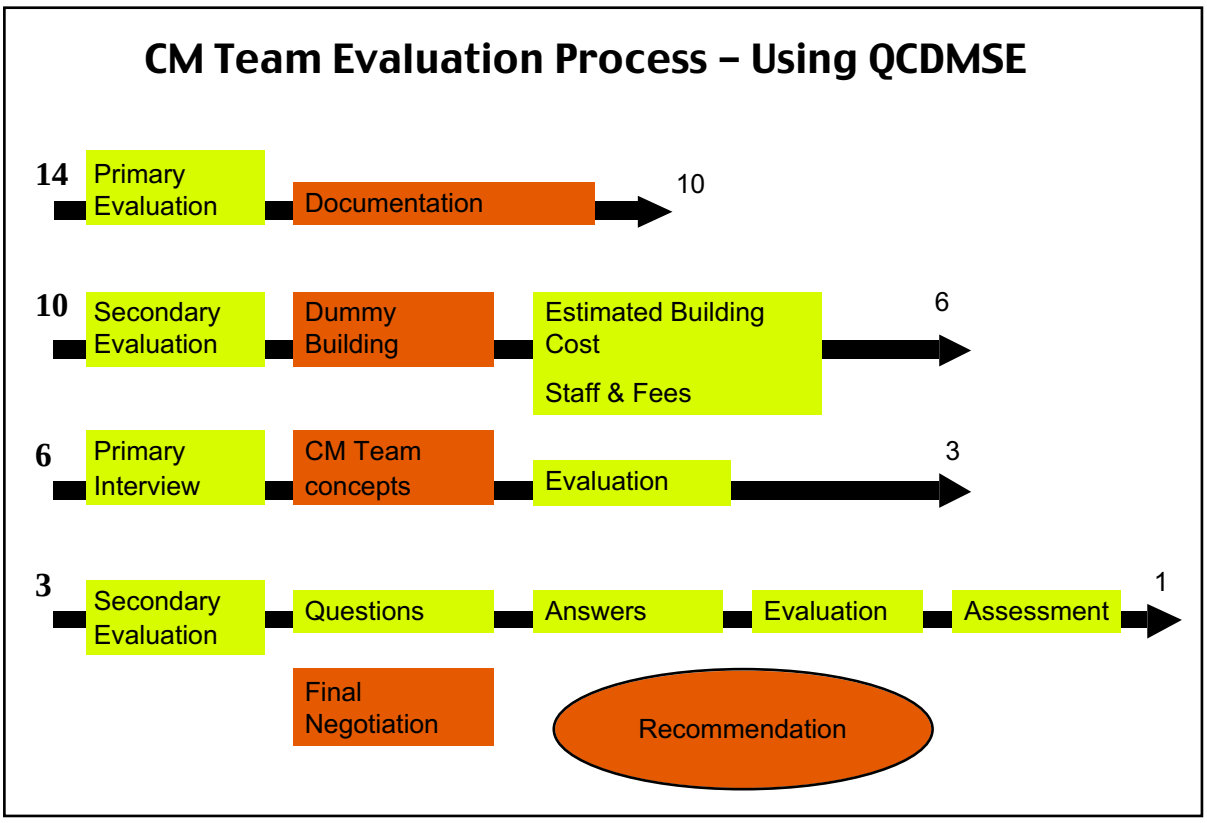
3.6.8.1 Management – 22%
3.6.8.2 CM Fees and staff cost – 22%
3.6.8.3 Delivery – 15%
3.6.8.4 Cost – 15%
3.6.8.5 Quality – 11%
3.6.8.6 Safety – 7.5%
3.6.8.7 Environment – 7.5%

3.6.9 The highest weighting of 22% was given to Management and also to the CM fees and staff costs. However this meant that 78% of the selection criteria for the CM was not related to his proposed fees. The weighting for approach to construction cost was only 15%, the rationale being that whilst cost issues are very important, without the right management and approach to delivery it would be unrealistic to expect a successful project from a financial perspective. Environmental issues came last simply because the project was under a rigid environmental regime imposed by internal policy considerations and also a project specific environmental impact assessment. The skills being looked for in the prospective CM were essentially to manage Construction within these pre-defined environmental restraints rather than develop new environmental standards. A similar view was taken in respect of safety. Honda has its own internal safety regime and this coupled with the CDM Regulations meant that primary assessment was made on the prospective CM's ability to manage and delivery within these pre-defined safety constraints.

3.6.10 An example taken from a QCMDSE assessment form is separately annexed to this report at Appendix 5.

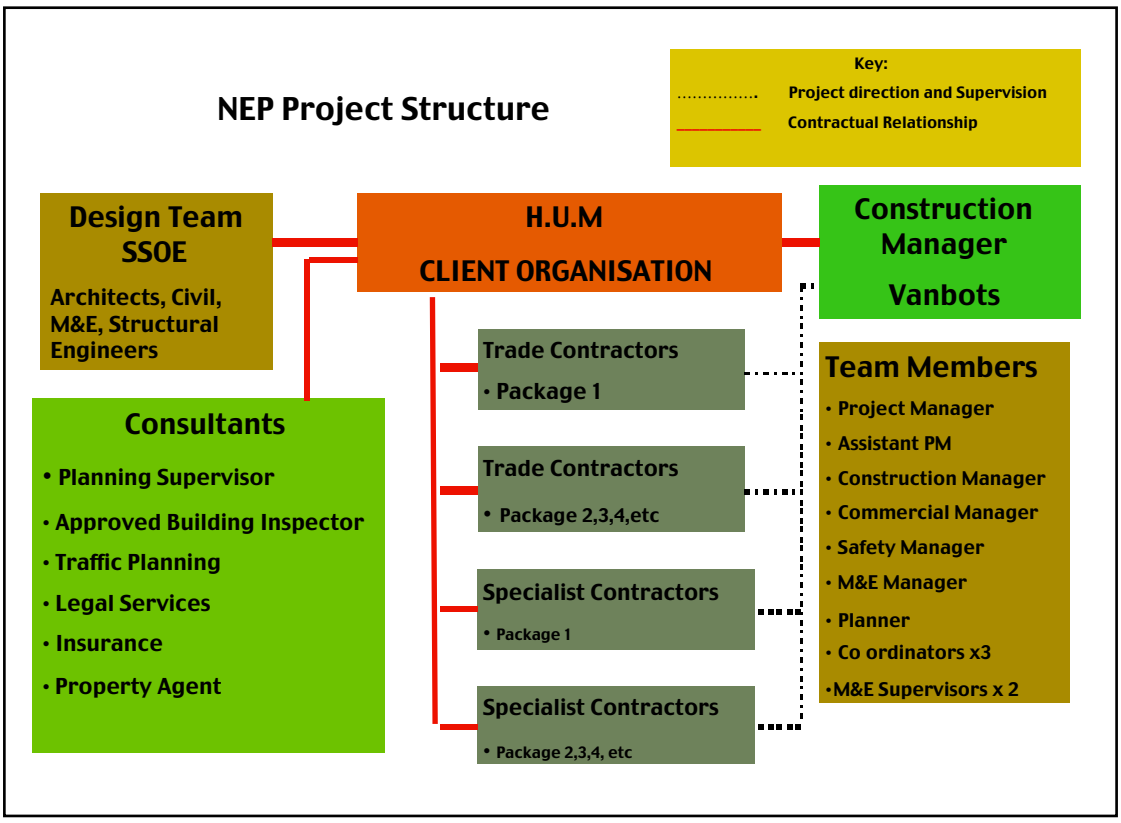
3.6.11 As a result of this final interview process the Canadian Company Vanbots, was selected to act as Construction Manager for this project. Vanbots had no previous UK experience although they had completed a similar project for Honda in Canada. This appointment may appear at first instance somewhat illogical. On the one hand it could be seen as a high risk strategy using a CM with no UK experience, on the other Vanbots were the "experts" in what was going to be built. This decision exemplified the Honda culture of "challenging the status quo" but not before they had prepared a thorough assessment of what they wanted and then measured each prospective CM against that profile via the QCMDSE system.

3.6.12 The key decision was in identifying the need for a CM that had appropriate experience, who would compliment the others already in the team and who would work comfortably within Honda's open and transparent project culture.



3.6.13 What was also interesting at the interview stage was that Vanbots were able to demonstrate their confidence in a budget of £760 per M2 (based on the dummy building and their knowledge of measures that could be introduced to effect savings without affecting functionality). Vanbots figure of £760 per M2 was close to Honda's own internal assessment. However all other organisations put forward budgets which were significantly higher (i.e. in the range of £800 - £1000 per M2).

3.6.14 Vanbots proposed a staff structure of 16 site staff which was significantly lower than that proposed by all other organisations and Vanbots professional fee was neither the lowest nor the highest proposed.



3.7 Value Engineering

3.7.1 All Honda projects as a matter of policy undergo a Value Engineering (VE) process at which the proposed design is reviewed by all key stakeholders.

3.7.2 For this Project there were three principle VE sessions the first was held at SSOE's design office in Ohio, USA in June 1998, the second occurred at Swindon in July 1998 and the third at Vanbot's Toronto office in August 1998.

3.7.3 Each of the 3 principle VE sessions took 3 – 4 days and included key representatives of the Designers, Honda and Vanbots. The sessions comprised a mix of small special interest cluster groups of 4 – 6 and larger review groups (usually at the end of the day) numbering approximately 20.

3.7.4 An external facilitator was not used for the workshops, as is often the case for some large projects. The facilitator for the main workshop sessions was SSOE. However the chairmanship for each small "cluster" group was regularly changed to ensure that appropriate expertise was leading the discussion.

3.7.5 Tony Damon, of designers SSOE, further describes the VE process below:

3.7.5.1 The value engineering sessions included representatives from Honda, Vanbots and SSOE. SSOE acted as facilitator of the session, recording ideas and the evaluation by the group. Minutes of each session were kept via electronic whiteboard. Ideas were encouraged from all participants in a "brainstorming" type session. Suggestions were then evaluated for technical merit and feasibility (SSOE); construction cost and constructability (Vanbots); and general acceptability, long term impact on the life of the facility and value (Honda). The final decision on implementation was, of course, left up to Honda.

3.7.6 The key outcome from the VE sessions was a radical decision to construct the Paint Shop within a lowered basement portion of the site. Traditionally Paint Shops (which are a large part of a car plant) are built on mezzanine floors above ground level. In this instance huge savings on earthmoving were

made by adapting the design solution to suit the existing topography. The functionality remained unaltered.

3.7.7 Tony Damon of designers SSOE further describes the background to the Paint Shop VE decision below:

3.7.7.1 "The value engineering idea that, perhaps, had the largest impact on the facility design, construction and cost savings was the decision to lower the Paint shop operational floor. Traditionally, Honda constructs a mezzanine level above the level of the main plant floor to carry out this operation. The VE group identified very early on in our sessions that there could be significant cost savings to the project if the mezzanine level were brought down to the level of the main plant. Due to the sloping nature of the site, this saved considerable amounts of imported fill that would have otherwise been required. ***I believe this concept challenged Honda's paradigm of a paint shop.*** *"*

3.7.8 Other savings were achieved by changing the structural steel from grade 43 to grade 50 steel and by a rigorous evaluation of hanging loads. On previous car plants there has been some "overcapacity" designed into the roof structure to allow for future increases in hanging loads arising from additional services, overhead walkways and conveyors. In this instance the project philosophy was to keep increased capacity to a minimum but instead allow the opportunity of isolated strengthening in areas where hanging loads need to be increased at a future date.

3.7.9 As a result of the Value Engineering workshops in the summer of 1998 the agreed budget for the project was reduced from over £760 per M2 to £734 per M2. Design progressed in the autumn of 1998 following the Value Engineering workshops however the project did not commence on site until the summer of 1999. This was in part due to Honda's extended negotiations with the Planning Authorities relating to environmental impact to external highways.

3.8 Effective communications - Co-ordination between Trades

3.8.1 Honda has on its construction projects since the early 1990's, adopted a management philosophy of "openness" which it first used with its automotive suppliers. This means all parties working on site share information about their own plans and problems. An approach, which on many UK construction projects would be seen to be "dangerous" or "high risk".

3.8.2 Much of Vanbots construction work in Canada is carried out in a similar "open" way and so there were no "obstacles" to Vanbots buying in to the Honda culture.

Strategy

Open Managed Approach

Non adversarial – Contracts, Meetings and Communications

Transparent operation

3.8.3 In practical terms this meant, for example, weekly meetings chaired by Vanbots with all trade contractors being represented at a senior level. At these meetings the "look ahead" programme for the whole site would be projected on to a large screen and all difficulties discussed in open forum. There was no hiding place for the contractor who had a late delivery, the Designer who was late with design or indeed for Honda who was delaying the finalisation of a detailed design brief.

3.8.4 The co-ordination meeting would therefore be aware of all "risks and threats" to the project programme. However Vanbots as construction manager adopted a pre-emptive and pro-active approach to problem solving at this meeting. This typified their dealings with the trade contractors. In essence the philosophy of the co-ordination meeting would be for all present to look for "counter-measures" to resolve risks. The prevailing project culture amongst all trade contractors was to jointly agree strategies to resolve problems rather than to use them as reasons for delays and claims.

3.8.5 Vanbots management style certainly reflected the Honda philosophy.

3.9 Effective communications - Co-ordination involving Designer

3.9.1 Honda and SSOE have worked closely with the selected Steelwork Contractor (Severfield Reeve) on a number of Projects. Honda and SSOE were therefore confident in Severfield Reeve's design ability.

3.9.2 This meant that a direct communication link was set up between SSOE and Severfield Reeve. Naturally Vanbots and Honda were kept informed as to how the detailed steelwork design was evolving. However, the effect of the direct communication between these key specialists meant a smoother and more efficient flow of information and rationalisation of design.

3.9.3 In practical terms there were fewer "misunderstandings" between Fabricator and Designer than might otherwise have occurred under a more traditional arrangement in which the trade contractor is kept at "arms length" from the professional Designer. It is hard to measure the true effect of positive communications such as these, however it is considered that a layer of drawings was saved from the overall process by facilitating this direct communication.

3.10 Planning

"*Why should Honda have to be dependent upon a random aggregation of events when it procures construction*"? - **Mike McEnaney (Director of Business Administration, Honda of the UK Manufacturing Ltd.).**

3.10.1 Honda places great emphasis on planning and on process management systems. This is an unavoidable consequence of the core business which undertakes the following:

3.10.1.1 Capacity to produce up to 1000 vehicles per day.
3.10.1.2 Installs 3,000 – 4,000 components in every vehicle, the components naturally need to be assembled in the correct sequence.
3.10.1.3 Employs just over 4000 people at Swindon on the two car plants.

3.10.2 Moreover the automotive business requires process synchronisation and co-ordination of the highest level. As mentioned elsewhere, in a production line the process demands the right component at the right time, otherwise the production sequence spins out of control. There is not the flexibility in this part of the business, which is found in other industries.

3.10.3 This leads to further process and planning detection systems to ensure a rapid response when the line stops working and also statistical analysis to identify maintenance risks. All of which encourages a culture of pre-empting as well as rigorous testing of existing procedures. The philosophy is to identify potential problems before they arise whereas in many industries (including construction) the more normal state of affairs is to "deal with problems as they arise".

3.10.4 Applying this thinking to Honda's construction activities results in a greater emphasis on planning (from the Employer's perspective) than on most similar UK projects.

3.10.5 In particular Honda prepared its own project programme using in house expertise and seconded staff.

3.10.6 The Programme was refined, developed and updated by the Construction Manager (Vanbots) working alongside Honda staff.

3.10.7 The programme was given very high visibility throughout the project by requiring all Trade Contractors to submit a programme in electronic format (Microsoft Project) at inception of their work and to update it with actual progress on a weekly basis. Honda provided some training assistance when needed as it recognised that not all of its Contractors had all the necessary skills.

3.10.7.1

3.10.8 This meant that at all stages of the project Vanbots and Honda had access to a "real time" project programme embracing all packages of work which thereby produced a realistic projected completion date based on actual progress to date.

3.10.9 The programme was then reviewed at trade contractor meetings by projecting it on to a large whiteboard (i.e. a smartboard – refer to later). The programme was used to identify potential problems, "what if" scenarios were highlighted and discussed with all Contractors present. Thus the effect of a potential delay by one Contractor was visible to all.

3.10.10 The programme of construction activities embraced some 3000 activities but weekly reviews were focussed on a "look ahead" for the next 2 – 3 weeks thereby bringing down immediate activities to less than 100 in number.

3.10.11 There were also regular Honda/Vanbots review meetings at which the programme and progress was reviewed and interrogated at a strategic level. This was particularly important because of Honda's developing technology in areas such as Robotics. This impacted upon the building itself, as certain building components could not be designed until the Robot arrangements were confirmed. Thus certain areas were built as late as possible to incorporate the latest Research and Development. The programme was used as a tool to manage decision making and identify the "latest possible decision date before the programme end date was threatened".

3.10.12 In essence the programme was used as a highly visible tool to "pre-empt" potential problems and to manage the remaining work (i.e. the future) rather than to identify where things went wrong after the event.

3.10.13 Martin Challons Brown of Marsh Consulting (Insurers and Risk Consultants) stated:

3.10.13.1 *"This project benefited from **detailed advance planning** including specifications developed with input from all stakeholders so that there were 'no surprises' when letting out packages to contractors."*

3.10.14 Mathew Clarke of N G Bailey (Mechanical and Electrical Contractor) stated:

3.10.14.1 *"Overall master plan was good (it relied upon all sub-contractors inputting)".*

3.11 Pre-empting Philosophy.

3.11.1 "***Identify a problem, define it and solve it, collectively as a team***"**!** - Mike McEnaney (Director of Business Administration, Honda of the UK Manufacturing Ltd.).

3.11.2 The pre-empting philosophy was actioned in a number of ways. Some of these have been described already in the areas of weekly trade contractor meetings and detailed updated programmes.

3.11.3 It was part of the weekly project meetings to consider the key project risks and when appropriate certain countermeasures were put in to place. The countermeasures varied from certain contractors working overtime to developing an interim factory operational strategy for parts of the factory whose robot scoping was delayed by internal technology issues.

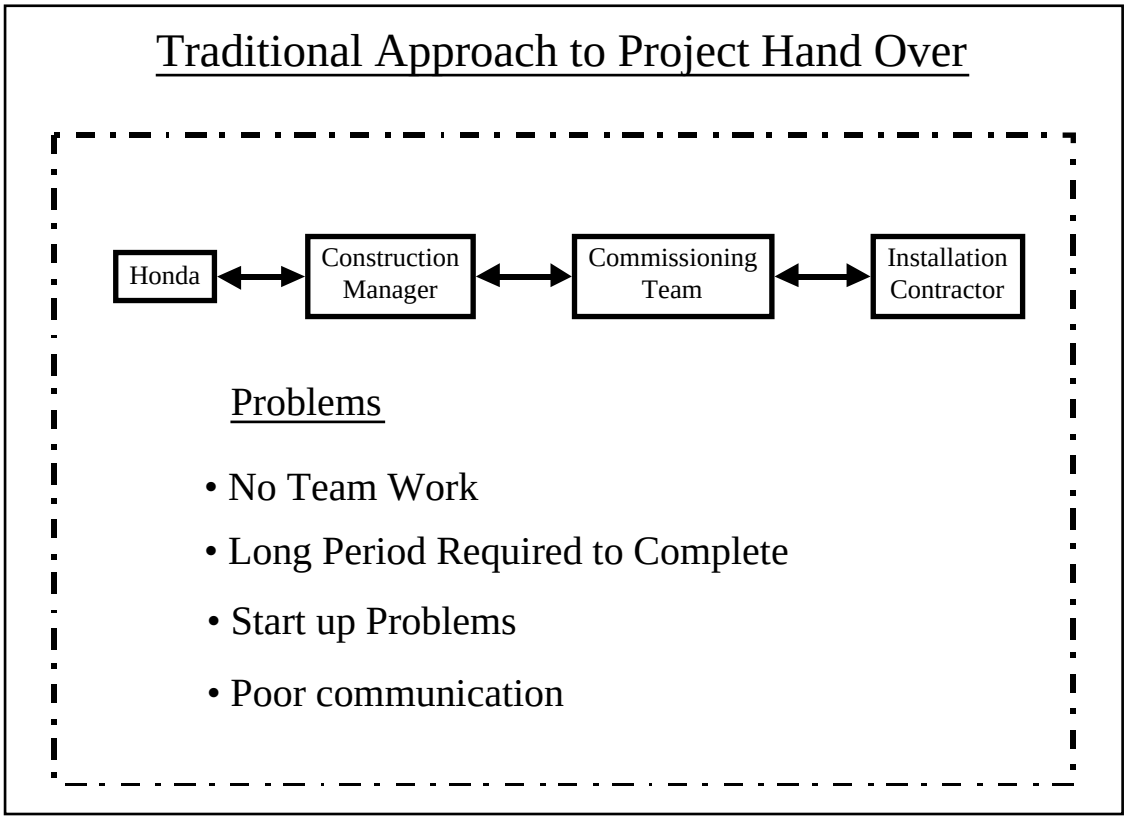
3.11.4 One particular area of pre-empting was in the field of commissioning. Commissioning is an area fraught with difficulty in heavily processed areas such as car plants. Moreover whilst commission problems are usually to be anticipated they cannot easily be overcome by a contractual sanction or by making one organisation responsible for everything. Commissioning is an iterative process, which depends upon a number of different components (and therefore packages of work).

3.11.5 Indeed on car plant 1 built between 1989 – 91 commissioning involved over 33,000 man hours in Engineers time. There was probably a similar amount of time spent by the Contractors who installed the plant and services. Much of this time involved re-work and investigating of the word of one person as against another after project handover by the Management Contractor.

3.11.6 Given this experience Honda took a pre-emptive decision on Car Plant 2 and engaged a commissioning team some 8 months before Practical completion. The brief of the commissioning Engineers was to work alongside the installers and understand the system throughout. The target was to reduce commissioning Engineers time to 5,000 man hours and more importantly to have a

working plant at Practical completion. Both targets were met, thus achieving zero down time at the start of manufacturing operations. Whilst this approach reflected the risk analysis carried out at the start of the project, it could easily be adopted for more traditional projects with different funding arrangements. All that would be required would be a review of the risk strategy at commissioning stage.

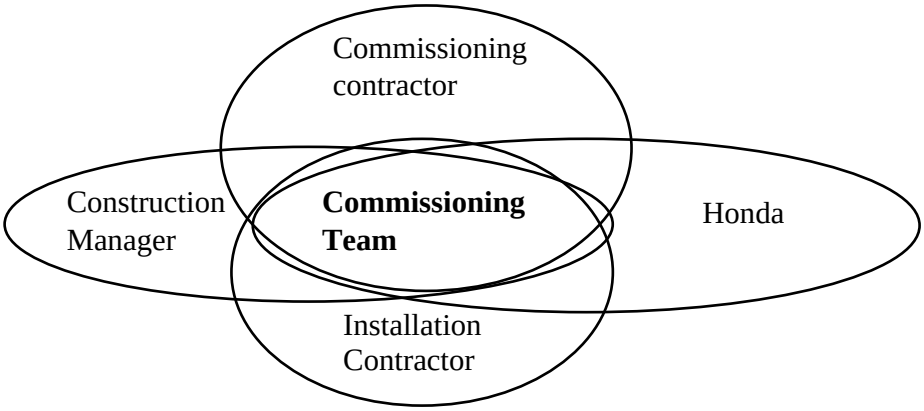
3.11.7



Commissioning Comparison Line 1 v Line 2

	Line 1 – E4II Actual Situation (1991)	Line 2 – NEP Actual (2001)
Manpower Actual	33,000 Man Hours	5000 Man Hours
Commissioning Time	3 years	8 months
Commissioning Cost	£300,000	£100,000

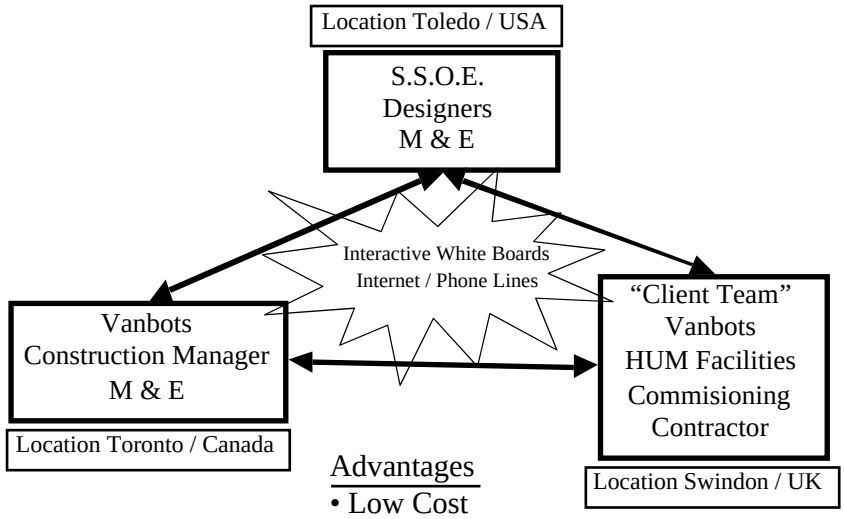
"One Team One Goal"



Advantages

- Team Work
- Fast-track commissioning
- Good (direct) communication

"One Team One Goal - Communication Flow"



Advantages

- Low Cost
- Good communications

Working together but taking accountability for their responsibilities.

3.11.8 David Law of Initiate Consulting (Seconded project management staff) stated.

*3.11.8.1 "Interactive co-ordination meetings, **forward planning integrated with contingency planning for high risk areas**, daily team meetings to ensure everyone knows what they are doing".*

3.11.9 Sean McGettigan of SIAC Construction (UK) Ltd stated:

3.11.9.1 "The project management team adopted a can do attitude from the outset which allowed an open discussions of problems as they arose."

3.11.10 Paul Rothera of Rothera Goodwin Chartered Architects stated:

3.11.10.1 "Honda are prepared to put in the extra work to ensure they have prepared themselves for most circumstances. This includes investigating options on potential problem areas before they arise."

3.12 Conflict resolution.

"***Claims represent inefficiency***. ***All benefit by working efficiently***" – Mike McEnaney (Director of Business Administration, Honda of the UK Manufacturing Ltd.).

3.12.1 In essence the Honda philosophy is one, which starts with a train of thought, which says that problems start small and get bigger if they are not identified and resolved. It is perhaps easier to imagine this perspective from the production line analogy where the same problem can repeat itself hundreds, even thousands of time a day if left unchecked.

3.12.2 Given this philosophy all problems were addressed openly and transparently at trade contractor and other key meetings as soon as they emerged regardless of contractual rights, remedies or blame.

3.12.3 Honda's and Vanbots "open" philosophy meant that all trade contractors knew where they stood in relation to the progress of other trade contractors and the project overall. Thus the trade contractors were made aware when their slippages were likely to impact upon the progress of others and vice versa. Indeed Honda would be the first to acknowledge that its own technical development in areas such as robotics lead to delays to certain areas of the building work.

3.12.4 The open communications enabled many trade contractors to make positive contributions. Whilst those with a background in claims would re-commend more limited sharing of knowledge the effect on this project was clearly positive.

3.12.5 There were justified increased costs incurred by a few contractors, primarily as a result of client changes or delayed decisions. This lead to negotiated settlements with all contractors such that all final accounts were agreed before the end of 2001 (i.e. within 3 months of the project being officially opened). Moreover there were no accounts, which needed resolution by an outside 3rd party (i.e. Adjudicator).

3.12.6 Sean McGettigen of SIAC (cladding Contractor) stated:

3.12.6.1 Regular meetings with the project management team to resolve progress and financial issues. As a result we had no financial disputes and our account was agreed in a progressive manner.

3.12.7 Matt Clarke of N G Bailey (M & E contractor) stated:

3.12.7.1 "Good management does not always require aggression and confrontation". Results can still be achieved in other ways

3.12.7.2

3.12.8 Martin Challons Brown of Marsh Consulting (Insurers and Risk Consultants) stated:

3.12.8.1 The key was regular update meetings, and the fact that everyone knew and understood each other's role and information / communication requirements.

3.13 Fair Contracts based upon appropriate risk

3.13.1 Honda engaged Freshfields to prepare trade contracts that fairly reflected the balance of risk between trade contractor and Honda.

3.13.2 The philosophy being that contractors should not have to price for risks that Honda is better off taking or managing.

3.13.3 The Trade contract was based on a modified JCT intermediate form. A standard form was chosen as the basis for the document since it was felt this approach was likely to be seen as less controversial from the perspective of the Trade Contractor.

3.13.4 The fair and practical approach to risk management (as reflected in the Trade Contracts) was seen by Carl de Rocher and John Martin of Vanbots as a key ingredient to the overall success of the project:

3.13.5 "Honda also has a far more practical approach to risk management; they do not just try to offload all the risks onto someone lower down the supply chain. They endeavour to put the risk with the party that is in the best position to manage that risk, and I believe that this is a key ingredient for the success of the project; by sharing the risk and allocating responsibility where there is control, you move away from the blame / claim culture of British construction, and keep costs manageable."

3.14 Early Warning Philosophy.

3.14.1 A key feature of the contract is the requirement of the trade contractor to provide an early warning of any problems as soon as they become apparent. This fits with Honda's "pre-emptive approach" to identifying and managing problems.

3.14.2 Essentially the Trade Contractor and the Construction Manager are obliged to give each other notice as soon as they become aware of a matter which may increase cost, delay the project or impair performance.

3.14.3 An extract from the trade contract follows below:

3.14.4 Early Warning:

3.5A.1 The Trade Contractor shall and the Construction Manager may give the other an early warning notice of any matter which in their opinion could increase the Contract Sum, delay completion of the Works, or impair the performance of the Works in use, as soon either becomes aware of it.

3.5A.2 Either the Construction Manager or the Contractor may instruct the other to attend an early warning meeting.

3.5A.3 At an early warning meeting those who attend shall co-operate in
making and considering written proposals for how the effect of each matter which has been notified can be avoided or reduced; and
deciding upon actions which they will take and who, in accordance with the Contract, will take each action.

3.5A.4 The Construction Manager will record the proposals considered and the decisions taken at the early warning meeting and give a copy to the Contractor together with any instructions he considers appropriate. Nothing agreed at an early warning meeting shall be binding upon the Employer unless the subject of a separate specific written instruction given by the Architect/Project Manager.

3.5A.5 If the Construction Manager notifies the Contractor that he is of the opinion that the Contractor did not give an early warning of an event, which gave rise to an extension of time, a variation, or a claim for direct loss/or expense, which an experienced contractor could have

given, the Contractor's claims in respect of such event shall be assessed taking into account any savings of cost and time which would have occurred if the Contractor had given the early warning.

3.14.5 Thus the contract provides for a separate early warning meeting as soon as one party is aware of a major problem. In practice however, the subject of early warning is first discussed and recorded at the weekly trade contractor meetings. If a potentially serious matter is identified as an early warning at the weekly meeting then a separate meeting is held to discuss the matter in greater detail.

3.14.6 In fact Honda adopted this "early warning" practice on several previous projects in the early 1990's. This was in fact prior to the publication of the New Engineering contract[8] which was the first standard form to include an "early warning" clause.

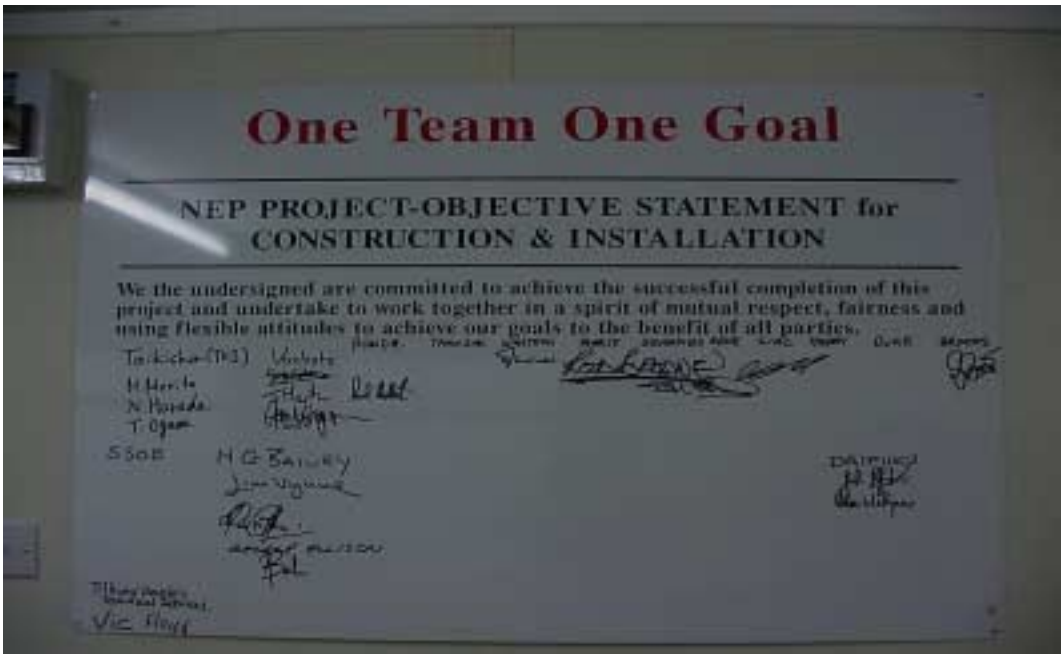
3.14.7 The successful use of the early warning philosophy and the fact that Vanbots have adopted it on other UK Projects is described by Carl de Rocher and John Martin of Vanbots below:

3.14.7.1 "One aspect of the project that we are using on other projects is the early warning clause. The early warning clause and especially the part that says that a meeting must be held as soon as possible or at least mitigate the problem is key to the team approach philosophy. If there is a problem, then bring it to the table and resolve the issue. The key is to deal with the problems as they rise. It is important to create an atmosphere or culture with sub-contractors in which they know they will be treated fairly and with respect."

3.15 Teamwork

3.15.1 In order to reflect the one team one goal vision a large board outlining the project charter was placed in the reception area of Vanbots project office making it highly visible to all staff, all contractors and all visitors. All Project Participants were invited to sign the board, the text of which was as follows:

3.15.1.1 We the undersigned are committed to achieve the successful completion of the project and undertake to work together in a spirit of mutual respect, fairness and using flexible attitudes to achieve our goals to the benefit all parties



3.15.2 One key to successful project teamwork was the fact that Contractors felt able to share information without feeling threatened. For example Steve Snow of Severfield Reeve (Steelwork Contractor) stated:

[8] New Engineering Contract (ICE – 1993)

3.15.2.1 *"The teamwork approach of Vanbots and Honda – especially when problems arose, they were sorted out by all parties, with the* ***only aim being to resolve the issue as quickly as possible****, and not to use the event to mount a claim or counter-claim."*

3.15.3 The successful project teamwork was seen by Carl de Rocher and John Martin of Vanbots as the most positive aspect of the project:

3.15.3.1 *"The most positive aspect of the project was the team approach with Honda. The shared offices and the white uniforms did help to create a "one team, one goal" attitude on the project. The open book approach by both parties was also a positive aspect of the project that allowed tender packages that met with the construction goals and Honda's goals while keeping within budget constraints. Vanbots' staff dressed in white, the same as Honda, indicating to all the 'One Team' approach."*

3.16 Integrated Project Teams

3.16.1 A key feature of Vanbots site operation was an open plan office shared with the Client and the Client's external advisors including the Designers.

3.16.2 There were short daily communication meetings first thing in the morning (Maximum 20 minutes – object to inform all of daily site activities and threats to progress).

3.16.3 All correspondence, programmes and project data was made available to all members of the project team both in hard copy and by allowing open access to Vanbots computer network.

3.17 Specialist Support Staff

3.17.1 Honda has for a number of years supplemented its own internal team with specialists in the areas of cost control, programming and safety. The arrangements are essentially of an ad hoc nature, support being brought in "as and when" needed.

3.17.2 However apart from keeping its own internal staff levels at an appropriate level Honda sees the main benefits of this approach in terms of cross fertilization of ideas and flexibility. All seconded staff fully embrace the single status Honda culture including the wearing of white uniforms.

3.17.3 The NEP Project involved seconded staff working as part of the Client team in the areas of Risk Management, Project Planning, Safety and Cost Control. All were given a wide brief to act in the best interests of the Project. In practical terms this meant often acting as facilitators and identifying areas where internal or external lines of communication needed to be to improved. The brief also included the identification of potential problems whilst they were still at the embryonic stage.

3.18 Front end Cost Control

3.18.1 Honda adopts a financial system on all its projects which it terms "Front end Cost Control".

3.18.2 A key feature of this system is that estimated costs to complete the project are reviewed on a monthly basis at the same time as actual expenditure to date is reviewed. Thus the risk of a sudden "jump" in out turn project cost is extremely low. Moreover as risk items such as unforeseen ground conditions are passed then the contingency allowance within the cost plan is either spent or removed and the project budget adjusted as appropriate.

3.18.3 Specifically this means that if a change in design is proposed then the anticipated cost of the change is agreed before the change is formally agreed. There may be circumstances, such as unforeseen ground conditions, where the change procedure needs to be managed very quickly. As an organisation Honda has the communication structure to so do.

3.18.4 The effect of this approach to financial management is that Honda has a realistic chance of achieving actual savings against agreed budgets. On many projects if savings are made in one area

they are spent elsewhere. In Honda's system savings against a risk item not materialising go back to the company, rather than on enhancements to the previously specified and agreed finishes. This scenario often occurs in the wider construction industry in order that the allocated budget is fully spent.

3.18.5 Another advantage of Honda's disciplined approach to financial management is that they are able to negotiate capital allowances with the inland revenue in a fast track manner, this gives the company certain cash flow benefits

3.19 Prompt Payment

3.19.1 It has been Honda's policy for several years of ensuring prompt and fair payments to all suppliers. In the early 1990's Honda paid all their suppliers by BACS on a regular date every month and gave advance notice of the precise amount due to be paid. This contrasted with many large organisations that used cheques, which were not always sent timeously.

3.19.2 Sean McGettigen of SIAC (cladding Contractor) stated:

3.19.2.1 Regular meetings with the project management team to resolve progress and financial issues. As a result we had no financial disputes and our account was agreed in a progressive manner.

3.20 Project Insurance

3.20.1 As part of Honda's project appraisal process it was decided that Honda would take out an insurance policy for the whole of the works. This decision was made as a consequence of the realisation that insurance of at least part of the works would be necessary once Honda started to take early possession of certain large areas of the building in order to install process plant and machinery. The prospect of Honda insuring part of the works and the CM or the trade Contractors insuring other parts of the works was not an attractive proposition. It would be complex to administer and would no doubt lead to duplication of cover and therefore wasted insurance costs.

3.20.2 The solution was for Honda to take out a block policy for the works and ensure the Contractors did not include for works insurance within their tenders.

3.21 Interactive White Board (Smartboard)

3.21.1 Honda has for many years used photocopier whiteboards as part of the automotive business in all it's meeting rooms at Swindon and elsewhere. They have been used as part of the automotive business for several years. These boards provide the focal point for the majority of meetings, whether internal or external, whether with Suppliers, Designers, Contractors or whoever.

3.21.2 The purpose of the whiteboards is to provide a focus for the meeting in what is normally a technical environment although it may not necessarily be a technical meeting. The boards allow the participants to draw diagrams, plans and sketches in just the same way that a "flip chart" is used. The boards also allow brief records of who attended the meeting and notes of key actions agreed at the meeting. All these boards have a photocopier facility so that at the end of the meeting each participant leaves the meeting with an agreed record of future action.

3.21.3 In theory it would be possible for the chairman to make similar notes on an A4 sheet of paper and then photocopy them for all present to take at the end of the meeting. In practice the whiteboard achieves far more because of its greater visibility. This means that all participants in the meeting are effectively stakeholders. Thus a comment on the whiteboard with which some of the participants disagree can be challenged and adjusted, this is much harder to achieve when it is on the Chairman's personal notepad! Moreover because all participants feel their voice is being heard the meetings become more productive and more constructive than in other similar environments. The taking of notes and agreeing actions in this highly visible way almost always achieves a consensus. If a consensus cannot be agreed then a record is nonetheless noted of the alternatives.

3.21.4 Moreover given Honda's "pre-emptive" and "no blame culture" Honda sees very little benefit in lengthy

meeting minutes. The whiteboard note in essence therefore becomes the record of the meeting. The advantage of this methodology is its speed, the fact all present agree the meeting record before it is finally printed and the fact that the management style is oriented towards future actions and deadlines rather than historical review. Essentially the whiteboard methodology reflects Honda's open and transparent philosophy.

3.21.5 Contrast the situation where everyone leaving a meeting takes with them a short written record of what has actually been agreed at the meeting with the all too common situation in construction projects whereby meeting minutes are circulated at the start of the next meeting which may be two or three weeks later. Consider also the situation whereby the next meeting starts with a long debate about the accuracy of the previous minutes and the downward spiral continues. Consider how much time is saved by Managers not having to write up lengthy minutes.

3.21.6 Honda's view is that lengthy meeting minutes rarely add value to the process and therefore they should only be taken as an exception rather than the rule. Whilst this may be perceived by some as a "radical" approach to take, it comes from a carefully thought through appraisal of the situation.

3.21.7 On the NEP Project the whiteboard approach to managing meetings was taken to the next level by the technical development of "interactive whiteboards" or "smartboards". These are essentially a combination of a "flip chart" and a computer screen. Individuals can make hand written notes on them but also computer generated images can be projected on to them.

3.21.8 This meant that project meetings had the facility of drawings, programmes, photographs or plain text being projected onto the screen. The images were then annotated or adjusted in a highly visible way to reflect the agreement of all present. At the end of the meeting the key action points together with the annotated drawing and programme extracts were then printed out and passed to all present in the normal way. In addition copies of these notes and annotations were then emailed to the relevant other members of the project team.

3.21.9 Moreover the computer used with the whiteboard could be linked via the internet to other locations, thereby creating "virtual meetings". Thus weekly project meetings were linked to Vanbots and SSOE's offices in Canada and the USA at key stages during the project. The design team in the USA could thus see the same image on their whiteboard as was on the whiteboard in the Swindon project office. Discussion then took place over the speakerphone as to how to resolve problems. This approach significantly improved the speed of decision making and dramatically improved communications. These improved communications greatly increased the effectiveness of the project team as a whole.

3.22 Use of technology

3.22.1 Honda is an organisation which is constantly looking for ways of using new technology, not as end for its own sake, but as tool to improve its existing processes.

3.22.2 The use of the Smartboards on this project is a case in point. The principle of whiteboards being used as the focus point for meetings had been established for several years at Honda (see above). The progression from Whiteboards to interactive Smartboards exemplifies how Honda uses technological developments. However the Smartboards are very much a tool, which improves the existing process rather than a fancy piece of technological wizardry brought in to create a misleading impression.

3.22.3 Vanbots as CM were very receptive to the uses of the Smartboards. In fact their Chief Executive, Keith Gillam describes below how the knowledge and skills acquired on this project has been used to win major projects back in Canada:

3.22.3.1 "In June 2001 Vanbots acquired a prestigious project with one of the largest hospitals in Canada. Sunnybrook & Womens College Hospital awarded Vanbots Construction an $85 Million construction management program for M-Wing comprising a three floor addition over existing operating theatres used for trauma. This hospital is the major trauma centre for Southern Ontario. Our task is to install gynecology and obstetric facilities including operating rooms in addition to orthopaedic facilities combining three major hospitals into one major facility. In addition we were advised that we would be continuing through a ten year master program should we deliver the services in a successful way.

3.22.3.2 In securing the project we brought one of our staff from the UK to demonstrate the Smartboard System technology. We successfully convinced Sunnybrook that the systems that we had developed in England with Honda would control the project in terms of programming and project control administration such that a seamless and integrated information flow between design and construction team would be of major benefit to this client. Of all the major construction companies invited to provide proposals, Vanbots was considered to be the only firm that provided this system.

3.22.3.3** Vanbots Construction recently acquired the expansion to the Royal Ontario Museum in Canada, destined to be the largest natural history museum in North America. This important facility is undergoing a **$200 Million expansion program**. Vanbots was retained in a highly competitive construction management proposal call. The architectural selection had reached a short list of three architects. Byng Thom from Vancouver, Andrea Bruno from Italy and Daniel Libeskind from Berlin. We were able to demonstrate that due to our Smartboard technology, the location of the architect or any of the design team consultants was immaterial. Communication on design development was instantaneous and bridged any geography no matter which architect was selected. We were retained to comment upon the cost of design, the program of design and construction, and the impact on the existing museum, thus enabling the Royal Ontario Museum to select the appropriate architect considering all the facts. **The Chairman of the Board of Trustees**, in accepting the recommendation of Vanbots from the Selection Committee, noted that **"Vanbots is the most technologically advanced construction company of all those major construction companies that submitted proposals which is entirely in keeping with the global outlook of the Museum".

3.22.3.4 Ultimately the crystals of Daniel Libeskind was selected and Vanbots now are working with the Smartboard technology and an architect who is located in Berlin."

3.23 Staffing Levels

3.23.1 Vanbots proposals to act as Construction Manager included staffing levels generally lower than its competitors. The two main reasons for this was a management style which was very close to Honda's, coupled with their previous experience of constructing a car plant at Maple in Canada.

3.23.2 In the event Vanbots average project team numbered 15 in total and Honda supplemented this with

an average of 3 further internal/seconded staff for the project duration.

3.23.3 It is perceived that most UK organisations would be looking for a site team of 24 or more for a project of this size and complexity.

3.23.4 The key areas where significant staff savings were made were in the area of improved communications, no requirement for "defensive management" techniques and lower cost management requirements. Minute taking and "defensive" letter writing (i.e. blame culture) was kept to a minimum through the adoption of whiteboarded meetings for the whole of the project. When problems arose a short record of the facts was noted on the whiteboard and agreed by all, there was therefore no need to get involved in further lengthy correspondence. Most packages were let on a lump sum basis with a schedule of rates and provision for milestone triggered stage payments, thereby considerably reducing the quantity surveying input needed.

3.24 Safety Passports

3.24.1 Honda required that everyone entering site had to have a "safety passport" which was not issued until after each individual had attended an induction course carried out by Vanbots safety team. The induction course focussed on site specific hazards and more generic issues of personal protective clothing. The policing of this passport scheme involved a credit card sized photo card, which was checked by site security at the site entry point.

3.24.2 Honda and Vanbots required that all employed wore helmets, high visibility jackets and protective boots. Those who did not comply were made to leave the site.

3.24.3 Honda and Vanbots carried out regular safety awareness training and toolbox talks, particular as the site arrangements changed and with it the hazards. Certain areas such as the Paint shop were restricted to those who had received further training.

3.24.4 Whilst safety is never something to be complacent about the overall safety record of the project was significantly above the construction industry average in terms of the accident rate per 1000 hours worked.

3.25 Blue Book Conditions

3.25.1 Honda took the view at inception of the project that it wanted to encourage good industrial relations on the project. In risk management terms it was after all in Honda's interests to ensure that there was no industrial unrest.

3.25.2 Honda was not employing tradesmen direct and therefore had no scope for direct influence on pay and conditions. However it did make it a contract condition that the employment conditions of the trade contractors employees reflected the national agreements in terms of safety, general benefits and payment.

3.25.3 In the event there was no industrial unrest and therefore no need to investigate how rigorously this requirement had been applied in practice.

3.26 Contractor training

3.26.1 Prior to work commencing Honda held TQM workshops for all prospective Contractors and suppliers of professional services. Refer to Appendix 4 for an example of part of the TQM training material.

3.26.2 During the course of the project Honda facilitated training in Project Planning software (Microsoft Project). The cost involved was a few thousand pounds, however the benefit was considerable in that all parties were working to a common standard in the same way that excel is generally used as the common standard for spreadsheets.

3.27 Environmental Considerations

3.27.1 The existing Honda operation is accredited to the IS014001 environmental management standard. Honda were therefore keen to work with Vanbots and SSOE to incorporate good environmental practice within the construction project.

3.27.2

3.27.3 The building design incorporated a number of the BREEAM design considerations such as a recycled water system and maximum use of the site topography to minimise visual impact. Evaluations of the environmental performance of the building services plant and equipment were performed in order to select equipment that operate efficiently and minimise release of greenhouse gases. Some novel approaches were taken to predict the potential nuisance impact of the development on the local residents with the use of computerised noise modelling.

3.27.4 More obvious strategies were also adopted such as construction waste segregation and the use of imported recycled fill materials.

4 Lessons from Automotive Business

4.1 Total Quality Management (TQM)

4.1.1 The main feature of a total quality management culture is a Customer focus and the recognition that there are many Customers involved with any process whether it is building a car or building a car factory. The Customer is not just the end user but also the next person on the production line or the next Contractor in the chain (e.g. the Brick Contractor who has to build a wall on foundations built by the Groundwork Contractor).

4.1.2 The management style which is appropriate to a TQM culture places a premium on setting a clear vision, and operating in a way that encourages openness, trust, teamwork, a pro-active culture, a challenging culture, but also enables performance to be measured and improved.

4.1.3 Prior to the NEP Project commencing Honda arranged for a training workshop explaining their TQM philosophy to all Construction companies likely to be involved in the Project. Extracts from the TQM training notes given at this workshop are found at Appendix 4.

4.2 Continuous Improvement

4.2.1 Continuous improvement is very much part of a TQM philosophy. The objective is to find ways of improving performance, not only within the organisation but also within Suppliers and others (e.g. Designers) who have an influence on overall project performance.

4.2.2 The key features of a continuous improvement process are that everybody is involved in the improvement process and they should never to accept the status quo.

4.3 Gap Analysis

4.3.1 It is a feature of Honda's automotive business that as part of the TQM process there is regular measurement of the "gap" between what was planned and what actually occurred.

4.3.2 The measurement can be in quality, money, time or some other variable. The purpose is to measure the difference and then understand why it occurred.

4.4 Effective communication

4.4.1 The effective communication principles such as using the whiteboard as an aid to facilitate meetings are probably the most radical and yet most simple methods that can be adopted in other environments.

4.5 Honda Culture

4.5.1 A culture which actively encourages questioning and challenges existing practices resulted in a

saving on Paint shop construction costs of over £1million through the Value Engineering process.

5 Conclusion

5.1 Summary

5.1.1 The project was completed on time and within the agreed budget. Indeed the saving of £33 per M2 (i.e. £734 - £701 per M2) equated to a further saving of £1.65M on the agreed construction budget.

5.1.2 Construction costs on a like for like inflation adjusted basis were 40% lower than on a similar plant built on the same site some eleven years earlier.

5.2 Central Question.

5.2.1 This aim of this report is essentially to answer the question "there are many good tools out there but most people don't use them – why?"

5.2.2 It is clear that Honda's own core values and culture demand that the status quo is forever under threat. Therefore Honda is forever considering new methods and tools they are fully evaluated and sometimes adopted.

5.2.3 Why is that not the case for other organisations? A clear theme emerged during interviews that neither Honda staff nor their advisors feel under threat of making a mistake.

5.2.4 As Mike McEnaney (Director of Business Administration, Honda of the UK Manufacturing Ltd.) put it:

5.2.4.1 "If the culture of never admitting to a concern dominated then it would not be possible to build a car!"

5.2.5 At Honda there are high expectations placed on all, but if a problem arises the pervading culture is to discuss the problem and share in it's early resolution. This is an important distinction between Honda and many other organisations where a risk averse, backside covering culture pervades.

5.2.6 The challenge for the construction industry and in particular the major clients, whom are the major instruments for change, is to recognise that there are huge benefits to be had by adopting the new tools and methods. Moreover it is not just about adopting these new methods but ensuring the culture is receptive to new tools and methods in the future.

5.2.7 The Authors believe that many Client organisations don't fully appreciate all the risks, which their projects and organisations face (i.e. if they do not fully understand the problem then how can they possibly develop a strategy to manage it?).

5.2.8 Some Client organisations perceive that by attempting to transfer all risk to others, whether Contractors or Designers they can satisfy shareholders, funders and other stakeholders to the Project. In reality it is not possible to transfer all risks and therein lies the crux of the problem.

5.2.9 Any project is liable to external risks including Political, Environmental, Economic, Social and Technical risks (the "PEST" factors)[9]. Furthermore risks faced by clients are wider than those normally associated with construction. Moreover the transfer of all the construction risk to the construction industry means transfer of control of the risk. The result of risk transfer away from the Client is that the Project is then managed without regard to the overall business needs of the Client.

5.2.10 For Honda it is important to be able to influence the project at all times. This is because the business need may have changed and also because the project may need "rescuing". If you have the ability to "get in there", then you have the ability to rescue it.

[9] "Control of Risk" - CIRIA 1996

5.2.11 Paul Rothera of Rothera Goodwin Chartered Architects stated:

5.2.11.1 Clients should try to follow Honda's commitment and loyalty to their suppliers and professional advisors and their challenging spirit, rather than hiding behind accountability and justification exercises. By remaining committed to their suppliers a working environment is generated which allows trust and understanding to develop to the benefit of the Client. Public clients need to look beyond the accountability issues. The total or overall value of the final product needs to be reviewed at all times. This total value should extend to reviewing the service provided as well as the usual budget and programme measures. Individuals in public client organisations need to be encouraged to take some risk when setting up project parameters.

5.2.12 Whilst there are probably several different answers to the answer to the question "there are many good tools out there but most people don't use them – why?" **The primary answer must be because of the "cultural barriers" in many organisations, which act as obstacles to change.**

6 Recommendations

6.1 Potential "Quick Wins"

6.1.1 We said the output from this report would include a list of tangible methods of project management, which having been successfully applied within the car industry and have been used equally successfully within construction. The truth is that all the key findings within this report have their origins in the car industry but have been equally successfully applied by Honda within construction.

6.1.2 We also said that those methods which could be readily adopted (i.e. quick wins) would be separately identified. These methods of project management present an opportunity for adoption by any organisation wishing to improve performance and reduce cost

6.1.3 However the key is an organisational culture which allows, indeed even requires, risk taking and change, but in a structured rather than reckless or foolhardy manner.

6.1.4 Whilst it would be good to simply list out the key findings and say the key to success is to adopt them, the truth is that before any change can be implemented within an organisation there has to be a **champion** to first instigate the necessary cultural change. However with that rider in mind we would re-commend the following "quick wins":

6.1.4.1 Challenge the status quo.

6.1.4.2 Learn about risk and then how to manage risk.

6.1.4.3 Recognise the importance of planning.

6.1.4.4 Recognise the importance of effective communications.

6.1.4.5 Adoption of smartboard methodology for improving the effectiveness of meetings and reducing management time writing up minutes.

6.1.4.6 Create integrated project teams and actively promote teamwork.

6.1.4.7 Accept that conflict (like risk) cannot be avoided and needs to be managed, use methods, such as "early warnings" to ensure potential problems are brought out into the open at an early stage.

6.1.4.8 Consider using experienced seconded staff as part of the Client team.

6.1.4.9 Recognise that Construction Management (despite criticism in certain quarters) can often offer the Client extremely good value for money.

6.1.4.10 Adopt Customer focussed Total Quality Management (TQM) methods.

6.1.5 If our "champion" can only adopt one recommendation then we would **suggest the adoption of smartboard methodology for improving the effectiveness of meetings and communication**, whilst achieving an overall saving in management time.

6.2 Suggestions for further initiatives and research

6.2.1 In essence this report simply provides a strong financial argument for Clients to adopt the Rethinking Construction recommendations made by Sir John Egan. The key drivers for change were identified by Sir John Egan as:

6.2.1.1 committed leadership,

6.2.1.2 a focus on the customer,

6.2.1.3 integrated processes and teams,

6.2.1.4 a quality driven agenda

6.2.1.5 commitment to people

6.2.2 Given Egan's recommendations and the 40% cost reduction achieved by Honda (without any functionality change) perhaps the main suggestion is to improve knowledge and education amongst the construction industry's key Client decision makers.

6.2.3 As to how to improve knowledge and education there is now far greater potential than ever before as a consequence of the Internet. Government sponsored agencies should make use of training opportunities and the internet to disseminate information as widely as possible.

6.2.4 Finally we note the implementation toolkit[10] for the Egan Report makes certain key recommendations which are very similar to our own**:**

6.2.4.1 Move from a risk averse culture.

6.2.4.2 Challenge the status quo.

6.2.4.3 Form integrated teams.

6.2.4.4 Appoint a "Champion" to make it happen.

6.3 Postscript – Rethinking Construction Award (March 2002).

6.3.1 In March 2002 the Western branch of the Chartered Institute of Building awarded Vanbots the "rethinking construction award" for their work with Honda on the NEP Project.

[10] Rethinking Construction Toolkit (2001) – implementing Egan's Report

7 Appendix 1 - Honda Philosophy (extracted from web site)

7.1 Mr. Honda

Soichiro Honda was an extraordinary man: both an imaginative dreamer and a commonsense engineer. A colourful non-conformist, he could sometimes be stubborn but was always humane and considerate. The eldest son of a blacksmith, Soichiro was born at Komyo, near Hamamatsu, in November 1906. His interest in all forms of machinery was kindled at his father's small workshop where Soichiro helped with bicycle repairs.

At the age of eight he first sighted a car that fired his imagination, then, and as a young man he built a series of racing cars, being lucky to escape serious injury when he crashed one spectacularly in 1936. In the following year, Soichiro set up a piston ring factory, responding to technical snags he encountered by studying metallurgy. In 1946 he set up the Honda Technical Research Institute, which despite its grand name was only a wooden hut. Seeing a desperate need for basic transport all around him in war-scarred Japan, he hit on a scheme. Buying a batch of 500 surplus engines designed to power military radio sets, Soichiro gathered a team to help him attach them to pedal cycles.

Honda's own-made products duly followed and the Honda Motor Co. was established in 1948. During the 1950s, its founder's creative genius propagated a stream of innovative designs making Honda the world leader in motorcycle engineering within an amazingly short time. Awed by the Isle of Man TT when he first visited Europe in 1954, Soichiro made racing success a goal, knowing it could greatly benefit Honda. Affectionately known to his work force as 'Oyaji' ('Dad'), Honda inspired people to use their imagination and give their best. He was willing to put trust in young people and give full rein to their creativity.

Believing that people should advance on merit and not through nepotism, Mr. Honda refused to put relatives in senior posts, and when he retired in 1973 he put the company in the capable hands of Kiyoshi Kawashima. Soichiro then devoted himself to the Honda Foundation, seeking harmony between technology and the environment. Having fulfilled countless dreams over half a century, he died in 1991 leaving his wife Sachi, a son and two
daughters.

7.2 Core Values.

Honda is a **philosophy based** company more than a marketing lead company. Therefore, how we do things is as important as what we do and what we say. In this light our brand is the beating heart of our philosophy.

All brands have certain attributes they call their own. These are attributes no other competitor can copy. This is personality. Our personality is best explained by our brand values. They are:
Advanced, Challenging, Quality & Partnership

So what does this really mean?

Advanced refers to both our search for advanced technology but also to our desire to be an advanced thinking company in all our day-to-day activities. Two examples are "Dolphin" and "P3". "Dolphin" or econocar travelled 3,014km on a single litre of fuel. Honda has built a robot called "P3". It is the first robot capable of walking up flights of stairs - a problem that has daunted robotic engineers for decades.

Challenging refers to our "natural" spirit and the fact that racing is our DNA. With this information it is no surprise that we won Formula one constructor's championship every year between 1986 and 1991. We have also won the last two solar car races between Darwin and Adelaide. In the last race when the competitor cars carried just the "pilots" our Dream 2 carried the pilot and passenger and still won.

Quality refers to our engineering, which can be enjoyed with confidence, affordability and reliability. For instance there have been no mechanical faults reported in our VTEC engine systems since 1992. So this will explain why Honda generators were selected to help construct the Channel Tunnel. Ninety generators for eighteen hours a day, for three years - and none of them broke down.

Partnership refers to out relationship with our employees, suppliers, investors, society, environment and universe. We essentially want to be a good citizen and corporate management is based on respect for human dignity. "*First Man then Machine*", applies to our corporate behaviour. Partnership is also why we do not boast about being the largest engine
manufacturer in the world.

7.3 Honda Initiative – challenge through competition

The Honda Initiative: challenge through competition.

Honda stunned the world in 1954 with the announcement of its participation in that year's Isle of Man TT races. Then in an even more startling development, Honda - which had not yet begun producing automobiles - went on to build its own racing circuit at Suzuka in 1962, a bold move which led to an explosion of Japanese enthusiasm for motor sports. Before long Honda was entering Formula 2 and Formula 1 competition, honing and refining its growing expertise. Currently Honda is known throughout the world for its consistent, pioneering role in motor sports.

8 Appendix 2 – Performance Appraisal (Financial and Programme)

8.1 Original cost estimates.

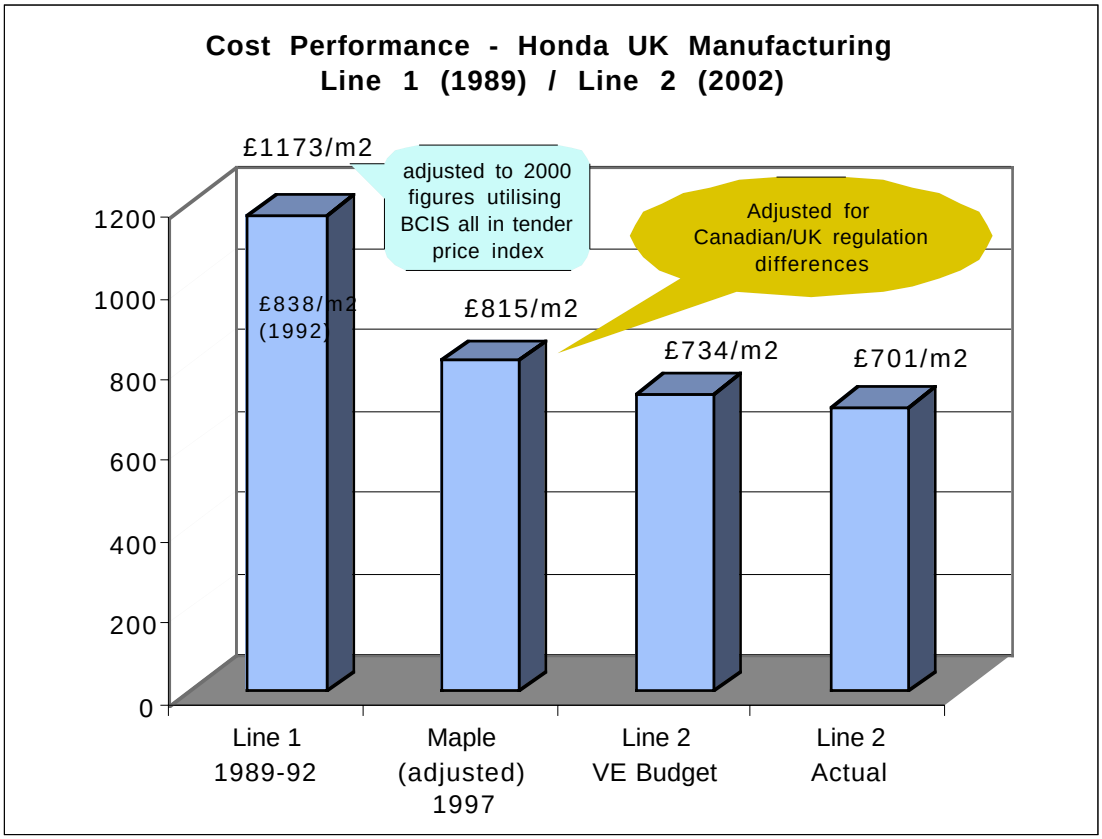
Original Construction Manager Budgets £800 M2 - £1,000 m2 (except Vanbots)
Honda - £760 M2
Vanbots - £760 M2

8.2 Revised cost estimates (after Value Engineering).

Honda/Vanbots - £734 M2

8.3 Out turn costs.

Actual - £701 M2



8.4 Original Programme.

Planning Approval – May 1999

Commence Construction on Site – September 1999

Target Complete Construction on Site – March 2001
Target Commence Process Installation – July 2000
Target Commence trial car production – June 2001

8.5 Out Turn Programme.

Commence Construction on Site – September 1999

Actual Complete Construction on Site – May 2001 (21 month site period)
Actual Commence Process Installation – August 2000
Actual Commence trial car production – June 2001 (as target)
Official Opening Ceremony – September 2001

9 Appendix 3 – List of Project Participants

9.1 Legal and other Professional advice including Design

Building Control – HCD
Civil, Structural, M and E Design - SSOE of USA
Commissioning Support – Haven Engineering
Fire Safety – Tenos
Ground conditions - GRM Ltd
Heath and Safety Consultants – ECIA
Highway Studies – WSP Consulting / Symonds
Land Survey – Greenhatch
Legionella Risk Assessment – Brocol Consulting
Planning and Environment – Rothera Goodwin
Planning Supervisor – PCM
Solicitors – Freshfields

9.2 Seconded Staff.

Bayfield Associates
Curry and Brown
Franklin and Andrews
Initiate Consulting

9.3 Trade Contractors.

A Plant	Temporary Site Lighting
Accord	FAC Office Furniture
Acklea Landscapes Ltd	Landscaping Patio and Grass Areas
ACS Testing	Ground testing for Bearing Capacity
All Mastic	Mastic Sealant to Paint and AF Slabs
Andover Controls	Building M/Ment system
Aries	Emergency Generators
Atlas Copco	Compressors
Autopa	Bike sheds
Avon Engraving	Traffic Light Labels
Bagnalls	Touch up paint to structural Steelwork
Bailey Telecom	Computer data equip
Barduct	Power Bus Bar
BB & EA	Hire edge equip
BetzDearborn	Chemicals
Blackford Fencing	Temporary Fencing and Gates
BOC	Compressed Gas
Camfil	Supply Temp. Filter Medium For Air Handling System
Carter	Cooling Towers
Ceramacoat	Epoxy Floor Coating Gemba Office
Chloride Power Protection	UPS System
Churngold Group	Temporary Road Works
Cleveland Cable Co	11 KVA Cable
Colt	Air Handling Units
Compco	Sprinkler System
Concrete and Coatings	Waterproofing
Cotswold Fire Fighters Ltd	Fire extinguisher supply
Crapper and Sons	Ground Works to Screening Bund
Crawford Doors	Rolling Steel Doors
Design Installation Service Ltd	Door Access System to Facilities Office
Dollcast	Misc. Metals
Downend	Floor Slabs and General Building works
Drain Brain	Empty Septic Tank
Drill cut	Diamond Drilling
Elite Security	Security Guards
Ellison	Substations
FenceHire	NEP AF Temporary Fencing
G Pearce	Site Preparation and Drainage
Hallmark Kitchen	Kitchen Equipment
Harlequin Engineering	Dock enclosures
Hawker Siddley	High Voltage Switchgear
Hays Chemicals	Chemicals
Hi Reach	Hire of Cherry Pickers
Hills	Skip Hire
Hinkins & Frewin	General Building work to Locker Building
Huber Technology	Gravity Settler
Igranic control systems	3 phase starter
JA Brookes	Syphonic Roof Drainage
John Reid and Sons	Shower test super structure
King Lifting	Lifting equipment
Kvaerner Cementation	Piling (General conditions)
Lafarge	External Works - Drainage, Parking etc
Lewis & Manley	Air Handling Units Steel

Mackenzies and Partner	Painting
Macwhiter	Air Conditioning Units
MEB	Earthing
Mechan Ltd	FAC Crane
Moeller	LV Motor control centres
N G Bailey	M & E
Powergen Energy Connections	Gas Supply
Quinshield	Industrial water pump booster housing
R Pring Electrical	Misc electrical Works
RCP Engineering Ltd	FAC Office Steelworks
Red Box Fire Control	Traffic Signs
Ridgeway Cleaning	Locker Build Final Clean
Ringway Highway Services	Ext highway works
Roberts & Prowse	Plumbing Connection to Site Cabins
Roberts and Prowse	Mechanical Shower Test bldg and misc mech work
S.E.C	Electrical survey of feeders
SBC	Road improvement contribution
Schneider Electric Ltd	Power Factor Correction
Scientifics	Noise Monitoring
SEC	HV Installation
Service Point	Electronic Data M/Ment System
Severfield Reeve	Structural Steel
Severn Vale Contracts Ltd	Landscaping
SGB	Scaffold Hand Rail Purchase
Siac Construction	Roofing and cladding
Simplex	Fire Alarm /Public Address System (PA)
Southern Electric Plc	Elec supply to off site Scheme
Southern Fire	Extinguishers
Swindon Lifting	Goods cage for FAC crane
T R Services (Bristol Ltd)	Perimeter Guard Rail System
Thames Water Utilities	Water Infrastructure
Tilbury Douglas Construction	Weld Slab
TP Aspinall and Sons	WWT Tanks and WWT Steelwork
TR Services (Bristol)	Perimeter Guardrail System
Trane	Chillers
Tranzac	Retaining Wall Package (Thermals)
Tremorfa	Misc electrical Works
Ultra Filter	Air Dryer
Universal Parking Systems	Traffic management
Walters UK	Foundations 2 Pile cap trimming & Grade Wall
Whitehead Electrical	Shower test Building electrics
William Dunk	Floor Finishes
Wingate	Temporary Power and Lighting

10 Appendix 4 – TQM Principles and Components (Part of Contractor training programme)

THREE BASIC PRINCIPLES

1 Priority given to Employees by effective two-way communication. To understand their views and comments, and to appreciate their viewpoint at the actual spot.
2 A priority order to be established for each job / function, with control items for major activities.
3 A firm and robust plan to be established and to spiral-up with CAP-DO, with regular confirmation of objectives, targets, achievements and gap analysis.

COMPONENTS OF A TQM CULTURE
1 Customer focus
- listening to both internal and external customer requirements
- measuring satisfaction / concerns / performance
- creating customer satisfaction

2 Inspirational Leadership
- creating and deploying a clear vision
- leading from the front by good example
- being visible, accessible, supporting and genuinely interested.

3 Ownership of work quality
- self diagnosis of achievement of quality
- self initiation of corrective / improvement action
- results made visible in the workplace

willingness to understand all elements of the process and share information
4 Effective work processes
- process control and capability establishment
- Processes improvement to improve results
- look for in process problems first, not just employees

5 Continuous Improvement
- never accept the status quo
- everybody is involved in the improvement process

6 Benchmarking for best practice
- proactive comparison with world class performers
- adapting and adopting best practices
- willing to accept other peoples ideas

7 Prevention / pro-active
- mistake proofing
- elimination of root cause
- design-based solutions - hard counter measures

8 Openness and trust
- regular open communication
- sharing business information
- empowering associates to act and take decisions

9 Teamwork
- team commitment and flexibility
- joint problem solving - not always top-down

clear roles and responsibilities

11 Appendix 5 –– Extracts from QCMDSE assessment form

	QCDMSE INTERVIEW CHECK LIST	H	M	L	TOTAL
		5	3	1	
Q1	How will you verify the quality of your employees workmanship whilst on site				
Q3	How do you verify the quality of information in O&M manuals handed over to Honda				
C1	Can you explain how you intend to assist Honda with value engineering				
C2	How do you control cost changes from your subcontractors				
D1	If you were experiencing scheduling problems mid way through an installation project what sort of activities would you employ to try and get back on programme				
D2	What is your minimum guaranteed response time to attend the Swindon site during normal working hours				
D5	How you can you guarantee you resource commitment to Honda				
D6	How do you propose to avoid claims?				
M5	What capabilities do you have for in house design				
M6	How can you demonstrate you competence to perform this type of design work?				
M7	How can you guarantee continuity of Honda site knowledge within your employees				
M8	What level of supervision would you propose to have on site at any one time?				
M15	What in house IT / CAD / Drawing facilities do you have				
M19	How would you co-operate with Honda's contract requirement for early warning.				
M20	How will you coordinate / manage document control, i.e. ensure use of latest design info.				
M21	Do you participate in any training schemes for your employees personal development				
S7	What do you understand by the Honda Safe Working Rules				
S11	How do you intend to manage site safety				
S12	What systems and procedures do you operate for the preparation of method statements				
E2	Does your company operate an environmental policy?				
WEIGHT, ?? times					
	Total				

12 Appendix 6 –– The Authors

12.1 Paul Roberts FCIOB MIMgt

12.1.1 Paul trained in Building and Civil Engineering and has worked at Honda of the UK Manufacturing since 1989. Paul heads the Construction and Facilities function and has ultimate responsibility for total Construction and Facilities spend. Paul has been responsible for introducing and implementing many of the company's Total Quality Management (TQM) features to the construction process. Paul has also been responsible for a number of innovations including the use of fair contract terms and Smartboards.

12.2 Richard Bayfield FICE FCIArb

12.2.1 Richard gained his early experience of Civil Engineering and Construction with the Costain group with whom he spent some 13 years both in the UK and overseas. He started as an independent Consultant in 1991 and has since worked with a number of blue chip organisations including Honda.

He has worked with Honda as a member of the seconded staff team since 1994. He provides support to Honda in the areas of programming, construction safety and contractual issues. Richard also lectures in construction project management at Oxford Brookes University.