

OPTIMISING INFRASTRUCTURE INVESTOR RETURNS – THE INNOVATIVE DELIVERY OF THE ENTERPRISE CENTRE AT THE UNIVERSITY OF EAST ANGLIA

Research into the asset delivery of the University of East Anglia (UEA) The Enterprise Centre (TEC) project undertaken by construction project management expert 3PM to assess the effectiveness of the use of an innovative, qualitative, behavioural process of emerging risk and trend identification.

NEC Case Study

INTRODUCTION

The effective delivery of capital projects is rarely understood fully at the actual time of delivery. It is therefore useful to reflect back upon the data captured throughout the life of any project to understand better the dynamics of teams and decision-makers and to capture the lessons learned.

In this TEC project at UEA, a very demanding project specification was adopted, delivered via a NEC contract form with a contractor led team signed up to the delivery of this upon appointment. The team performance was measured, and this reflective analysis was carried out to better enable the key players to understand the variables and factors at play and to learn from these findings before embarking upon the next challenging project of this kind.

Now that the dust has settled, and the project is two years into its post occupancy evaluation, this study demonstrates the value of smart tools such as RADAR to help teams understand and identify the early warning / risk scenarios they face whilst on a live project.

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The TEC Project

The project was conceived as a unique challenge and founded on the principles of collaboration. A prime contractor was appointed and put in a position where they had full responsibility for the completion of the project, managing all design and construction activity under an NEC Option C (Target cost contract). The NEC form facilitated the concept of all parties working in the spirit of collaboration. 3PM were appointed as Project Manager to ensure these principles were adopted throughout. Following an intense design & procurement exercise Option A was adopted to allow respective risk positions to be aligned.

Key to the delivery of the scheme was the engagement of all parties in the identification and mitigation of risk. The NEC contract processes and traditional risk management protocols were supplemented by an enhanced early warning mechanism - RADAR.

By engaging with all those involved in the supply chain at the outset – from design through to development – such as material suppliers and subcontractors, problematic issues were kept to a minimum and dealt with before construction commenced. A key example was the use of innovative thatched cassette panels to form the rain screen. Intensive prototyping was required to enable the traditional master craftsman's approach to be merged with more contemporary construction techniques of off-site manufacture of the panels and an evolution of the traditional techniques on site.

The numerous awards received by the project to date are testament to the innovation and design adopted but little recognition has so far been gained for the management processes that facilitated this journey.

The Research

The post completion research, encouraged by Professor John French, Chief Executive of Adapt Low Carbon Group at UEA, led by 3PM, looked into collaboration with ResoLex to answer the following:

- Did the ResoLex RADAR risk profiling service, used for the construction project enhance the identification of unforeseen risks and emerging trends?
- Was there an objective and unconstrained risk capture mechanism?
- Did the RADAR analysis highlight inter and intra-party differences?
- Was there a correlation between standard risk management techniques and the RADAR service?
- How does RADAR which is a qualitative risk process designed to assess the impact of behavioural issues, interact with more traditional quantitative risk methodology?
- Did RADAR promote the success of the project in terms of saving time and money?
- Did RADAR monitor the level of collaboration within the asset delivery team?

Research Context

The nature of construction procurement combined with the inbuilt human behavioural trait of over-optimistic reporting means that standard risk management techniques actively encourage the burying of construction risks prior to commercial agreement. Are such construction risks better understood and 'managed out' by use of RADAR?

At commercial close the momentum of winning, together with behavioural "optimism bias" can interfere with a truly robust risk assessment. This results in the tier one contractor holding unknown and not fully assessed risks. Post commercial close these risks pass down the supply chain invariably ending up with a party not necessarily best equipped to manage them. During the asset delivery phase these risks appear as potential conflict points and can result in cost overruns and a degradation of the asset.

The award-winning TEC developed by UEA is a proven exemplary low carbon asset, which forms the home to a new centre for the Built Environment. Asset delivery was part-funded by the European Union through the European Regional Development Fund (ERDF) with more funding from UEA, Biotechnology and Biological Sciences Research Council (BBSRC), Norwich Research Park (NRP) and BRE (Building Research Establishment) and New Anglia Local Enterprise Partnership (NALEP). While achieving the desired outcome of a world class facility of sustainable credentials designed to stimulate commercial enterprise, the asset creation process challenged the accepted practices for monitoring risk.

The scheme was devised as a unique undertaking, utilising innovative materials and aimed at setting sustainability targets far in advance of normal parameters. The challenge was set but it became clear, as can be normal in the briefing stages, that the targets and the joint end-user desires and requirements were collectively unaffordable. It was therefore necessary for all members of the core management team to fully understand the reality of the situation and work to find the solutions.

By creating a collaborative environment where views could be openly aired and discussed in a safe manner, these differences were highlighted, ensuring review, and keeping focus on resolving the key issues. At the outset of the procurement of the TEC as an infrastructure asset UEA's independent Project Manager 3PM recommended an innovative risk service, ResoLex RADAR, to UEA project sponsor Professor John French. The purpose of the service was designed to give a safe and confidential arena in which individual project team members could feedback information about their feelings of different project attributes.

On first inspection, many projects assume that this already exists through application of the NEC contract procedures via the established hierarchical reporting mechanisms and team meetings. However, from experience, 3PM has found that this reporting tends to concentrate only on historical measurable facts, rather than utilise the individual feelings of people on the ground who have many years of valuable project experience. So how were these feelings or feelings harnessed?

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Research Approach

3PM Partner & TEC Project Mentor, Patrick Watson and ResoLex Commercial Director, Stephen Woodward undertook the research and interrogation of the results and supported by RADAR panel member & independent construction risk consultant, Richard Bayfield prepared this report. The key findings are summarised below:

Analysing the Measurement of Perception during Asset Delivery – Risk and Early Warning

Once a month during asset delivery the wider project stakeholder team received a bespoke questionnaire. This allowed respondents to inform ResoLex confidentially of their gut feelings about the pre-defined key performance areas. Collation and analysis of all responses then took place by an expert ResoLex Panel, all with established industry experience and analytical tools at their disposal to explore this accumulated project feedback. Prior to inclusion in any report individual responses were anonymised. With rapid turnaround, the resulting reports were then shared with everyone in the stakeholder team.

The monthly reports presented an overview of perceived risks and issues along with early warning of areas of concern. The core management team then reviewed the report for the month at all the monthly project meetings and more widely at the quarterly continuous improvement workshops.

It is noted that these responses were not collated into NEC contractual Early Warnings as the process was not fully incorporated into the contract.

Figure 1 shows a typical contemporary monthly risk overview chart produced by RADAR from the findings of the collated responses during a reporting period. This showed the asset delivery team where responses from the stakeholders to each issue / risk were rated (high to low) and whether an issue or risk was improving or deteriorating.

RADAR questions asked of stakeholders during this asset delivery

Typically, the wider project team (including key sub-contract packages) were engaged via quarterly collaboration exercises and then invited via RADAR to respond to around fifteen questions each month during the construction project. These questions were of an open nature specifically designed to build trust and engender engagement with the team. The responses to the questions were confidential and anonymised so that only ResoLex was aware of response origination. The RADAR process recognises that we are all likely to hide matters (not disclose) which might reflect badly on us or our company. The anonymity and confidentiality of the RADAR process enabled answers to questions about the project to be given in a “no blame” environment. This meant that fewer matters were “hidden” than in a more normal project environment.

The subject matter of the questions was reviewed throughout the project and covered areas of project success as well as areas of project concern with the question content ranging across the project spectrum including funding, design, planning, coordination, relationships, collaboration, public relations as well technical construction content. Importantly for feedback purposes the questions were of a sliding scale nature and allowed free text response. Importantly for preparation of the risk register the questions allowed the ongoing monitoring

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of the rolling top five risks. The identification of both concern and success enabled a more balanced process. It also meant the monthly reports were more than just a list of concerns.

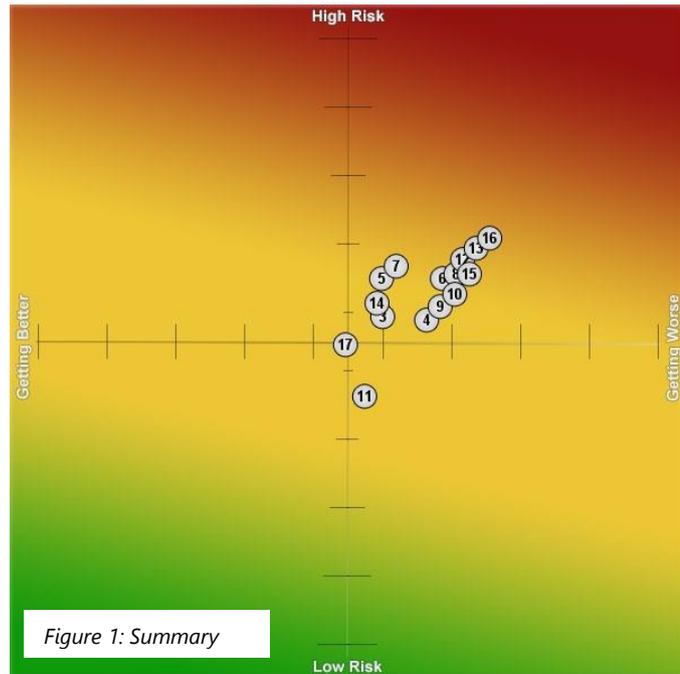
Figure 1: The below highlights examples of six questions from circa fifteen contemporary RADAR questions asked of stakeholders during asset delivery. *(As a point of clarification only: the chart below has more than six numbers. This is because the project at the time of this snapshot had circa fifteen questions in the RADAR monitoring process.)*

Q3 Do you feel the team is proactively identifying and mitigating unnecessary risk within the context of a pioneering project?

Q4 Based on where we are now and what we plan to do, please rate on the slider below your anticipation of your expectations (for the project) being exceeded?

Q5 Do you feel the team is communicating in an open and honest manner, at all levels such that it will prevent surprises across the whole project team?

Q7 Do you feel that your individual contributions are being listened to and communicated to the core management team?



Q8 Please rate your perception of the level of collaboration currently being achieved on the project?

Q9 Do you feel the team is proactively identifying and mitigating un-necessary risks, within the context of a pioneering project?

Post asset delivery research (using the analysis of responses during the project) showed three questions - Q4 (Personal Aspiration), Q5 (Communication) and Q8 (Collaboration) - the most representative indicators in measuring and trending feeling. As part of the post asset delivery research these three questions were then trended over time showing whether an issue or risk was getting better or getting worse during the asset delivery period as shown in Figure 2.

Research Findings

Following construction completion there was a compilation of a post-delivery trend analysis from research of the output gathered from the various monitoring systems used to track construction risk met during the delivery of the TEC asset.

The resulting TEC-RADAR Risk Review (shown below) is a combination, based on the project manager's traditional, formal risk reporting, the collated RADAR output, and a snapshot of the divergence between forecasted cost and authorised budget.

TEC – RADAR Risk Review

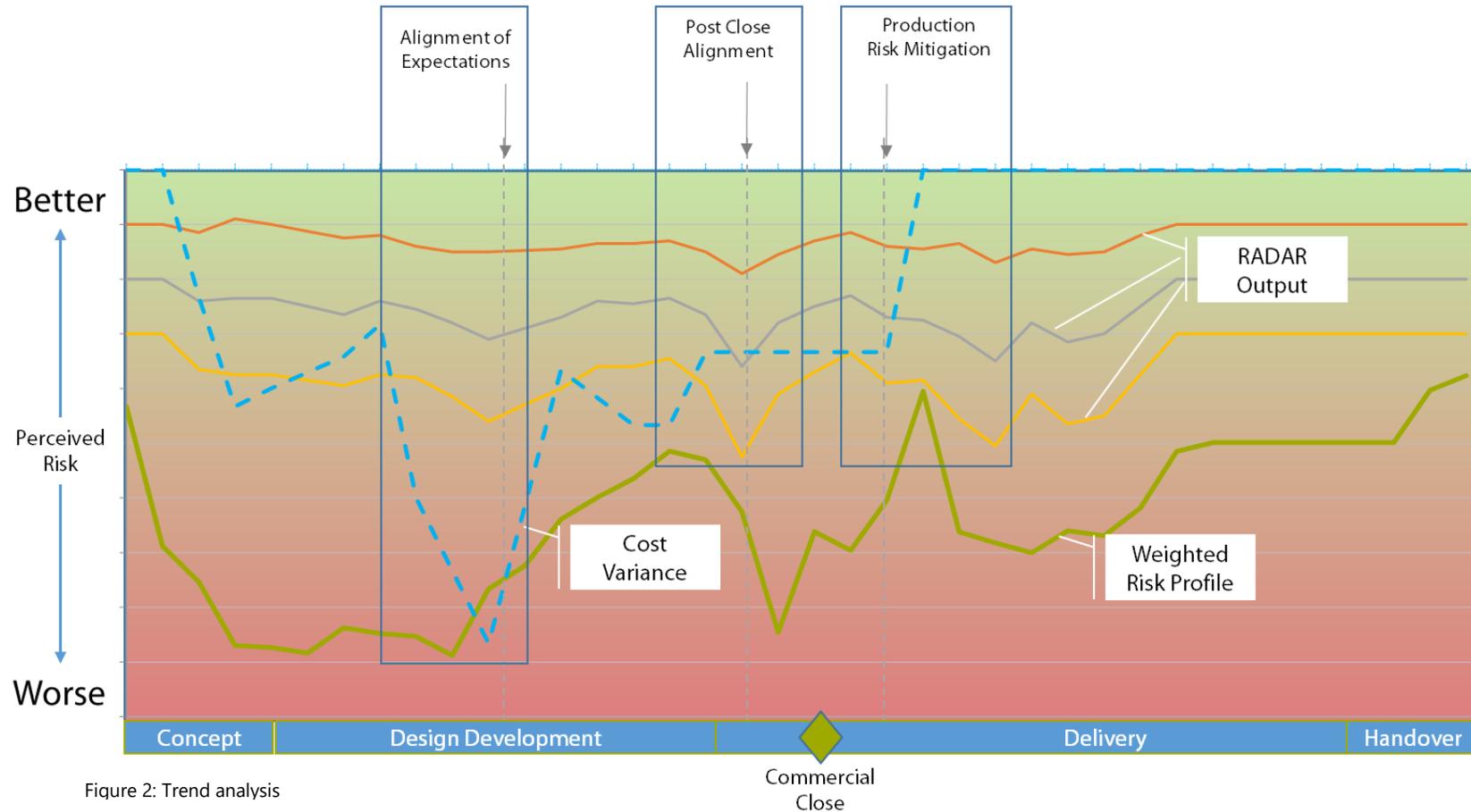


Figure 2: Trend analysis

ResoLex RADAR engages directly with stakeholders picking up information much earlier and the resultant shape includes spikes of immediate

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concern over emerging risks and issues – early warnings are found. The ResoLex RADAR response curves showed the following divergences in comparison to the weighted risk profile during the delivery of the UEA Enterprise Centre caused by the following concerns:

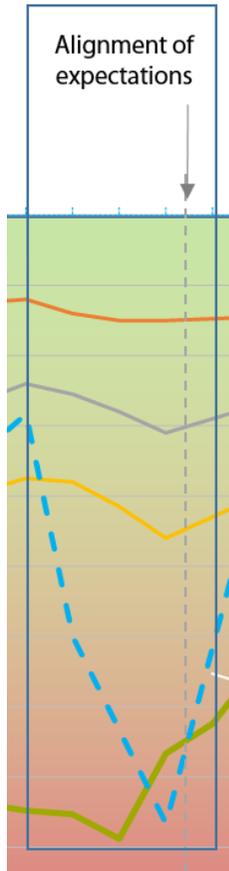
Stage: **Alignment of Expectations**

First identified 5 months earlier

RADAR PANEL – Issues raised

- General cost and funding to complete in accordance with expectations
- Inadequacy of time for costing exercises
- Lack of resources
- Potential stifling of innovation of new and unproven materials
- Need for supply chain contribution to cost solution
- Need to better understand risk issues
- Need for team to improve problem solving
- Challenge of moving from market tested cost to target cost
- Reconciliation of aspirations and affordability
- Mixed used design conflicts
- Lack of budget and programme clarity

Alignment of expectations



Point 4 – Post Close Alignment

First identified 8 months earlier

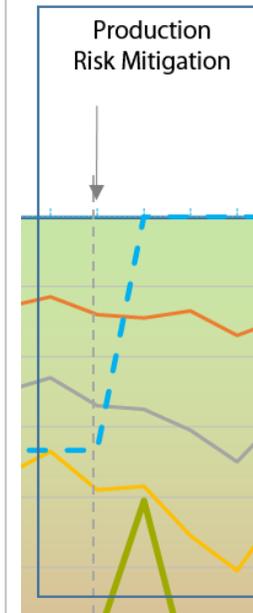
RADAR PANEL – Issues raised

- Senior management team changes
- Remobilisation and maintenance of collaborative culture
- Rebuilding trust following commercial negotiations
- More effectively engaging the whole team
- Rationalisation of single point delivery contractual relationships
- Progress to meet site activity schedule timescales
- Increasing wider stakeholder engagement with the project
- Ever-present first of its kind risk with Passivhaus build process using riskier materials

Post Close alignment



Production Risk Mitigation



Point 5 – Production Risk Mitigation

First identified 9 months earlier

RADAR PANEL – Issues raised

- Concerns around risk of using new and unproven materials
- Revenue works conflicting with Regional Development Fund targets
- Paasivhaus awareness of subcontractors
- Programme impact of design issues and design delays arising from late decision-making
- Delays in finalising / approving curtain walling, timber frame and finishes impacting on programme
- Further design review meetings necessary to ensure management team members' expectations
- Maintaining project within budget
- Stakeholder expectations relating to furnishings,

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With reference to the above three examples highlighted above on Figure 2 the effect of the RADAR service is seen as follows:

Panel Comment

It was clear during the reporting process that information about key issues was captured at a very early stage. This could be about a design or a construction process that would not happen for several months. Often one person would initially express concern about a matter. This was noted in the monthly report. The next month others would add their weight to this issue either via free text, or via the risk report, if it had been selected as a risk for assessment by the team. There were clear trends that emerged such as months with more risks in the red zone coinciding with forecast budget increases. It was clear that the participants felt confident in the security of the process because at times they used the free text to give very candid assessments of the performance of companies and individuals. One of the key roles of the Panel was to present such information in neutral language that did not condemn a company or an individual, but at the same time directed the leadership team to a matter which needed to be addressed. So, criticism of someone for not delivering foundation drawings on time was represented as "risk identified over late issue of foundation drawings". The process was used to de-personalise problems and in doing so enabled the leadership team to focus on factual matters devoid of personalities.

General

The three trend lines on Figure 2 are the result of analysis of RADAR Output, Cost Variance, and Weighted Risk Profile.

The methodology used by the Panel was essentially to first look at the raw risk data (i.e. the scores on the graphs) and then review the free text and comments made by the project team. The free text put into context the rationale for a particularly high score against for example "programme risk". The free text would typically contain a comment such as "given unresolved design issues relating to planning there is a risk that planning permission will be delayed". All the free text comments would be included within the appropriate section of the report under either "concerns/risks" or "opportunities/successes". As noted above the free text would be de-personalised but otherwise the wording would be largely preserved. So, for the planning example above the report would include the following:

"There is concern that unresolved design issues may delay planning permission which in turn will impact the programme".

A comment such as that above is purely reporting the facts as advised to the Panel. It is not offering advice since that was outside the remit of the Panel.

In a typical month there may be up to 25 different free text themes and the Panel would choose (from its own experience of such projects) the top 4 or 5 items to be mentioned within the executive summary. The aim was to provide the Employer and Project Manager with a short list of questions to ask such as "How can we troubleshoot the design for the planning application?" Essentially the RADAR report was providing the agenda for a focussed monthly meeting of the project leadership group.

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Alignment of Expectations

The 3 trend lines show a worsening of the team's views over a 5-month period ahead of the peak when the budget divergence was brought back under control. This then starts to improve at once following budget reconciliation. The Panel findings all reflect a lack of proper resource allocation and general team misalignment.

Panel observations:

The early monthly submissions by the project team made it clear that from day one that there was concern over lack of resources amongst other matters. The Panel believed this would be a normally expected scenario on many/most projects. It is axiomatic that construction consultants and consultants of all descriptions put in as much (or as little) as they have to in the early days of a project. Inevitably concern over resource levels is a repeated pattern.

Post Close Alignment

The 3 trend lines show a worsening and then sharp improvement at a key point. This reflected a change in the management of the design and the almost instantaneous team support for this change. The Panel's view about management changes again supported this action.

Panel observations:

At this time the Panel became aware of comments about both changes within the project team and also about the wider commercial discussions. This was a period in which the Panel sensed that the project was moving to a more "volatile state" but subsequent monthly reports indicated that whilst anxiety was heightened there were calming influences both individual and corporate.

Naturally this was the time when the project itself was at greatest risk.

Production Risk Mitigation

The 3 trend lines show a gradual deterioration over a 9-month period reflecting the introduction of the supply chain parties and their induction to the risks associated with Passivhaus.

Panel observations:

At this stage the project teams' overall perceptions and perceived risks moved from one of commercial dominance to that of technical concern. On the basis that the project was now commercially viable there remained a key concern that the project was not feasible from a technical perspective. The fact that technical standards were being challenged throughout the procurement process was seen as both a benefit and a burden. This would be the first Passivhaus building in the UK, but the assembled project team had the capability to deliver.

RADAR was updated monthly by taking the top 5 risks from the traditional methods and seeking the wider validation of these critical risks via the RADAR questionnaire.

Generally, within traditional construction risk management techniques the overall construction risk profile should use information from identified risks taken from the project risk register collected, collated, trended, and transparently reported. As a norm the risk profile should drop over the asset delivery timeline with the securement of the wider project sponsor development risks and as high tier-level third-party stakeholder risks are found and shared or transferred

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and appropriately mitigated on time by the best party able to mitigate the risk. The traditional risk register was subsequently quantified in terms of both time and cost impact.

The output in Figure 2 above shows five trend lines giving profiles as below:

- Project Manager's Weighted Risk Profile – data from the project manager's risk register weighted to take account of the time, cost, and quality impact of the risks.
- RADAR Output 1 - Personal Aspirations – RADAR Output from Question 4.
- RADAR Output 2 - Team Communication – RADAR output from Question 5.
- RADAR Output 3- Team Collaboration – RADAR output from Question 8.
- Cost Variance - relates to cost variance between projected out-turn cost and the authorised budget.

Within the discipline of construction risk management, a delivery team can be adept at solving an issue or risk once found. The key to improving risk management is setting up and promoting an early warning of the issue or risk. If effective, the early warning results in immediate resolution of the issue or risk or a risk mitigation plan is set-up promptly. If not effective, the issue or risk passes down the supply chain with the potential to come back up the supply chain as conflict if the issue or risk still is unresolved.

Construction asset delivery generally relies on two forms of cost control:

- 1) Cost planning undertaken on behalf of the project sponsor; and
- 2) Cost estimating undertaken by the contractor.

The former is a top-down process while the latter is a bottom up-process. To achieve a successful asset delivery outcome a cohesive integration needs to take place followed by a smooth transition from the cost plan to the cost estimate as the key cost driver. Failure to achieve this integration and transfer across all elements of construction results in the generation of contractual claims which translate into cost overruns.

In relation to the cost data shown in Figure 2, collated by Capita (the UEA appointed independent project cost manager) allows comparison of the forecasted costs against the construction budget. The cost divergence reflects the innovative concept of the facility and the alignment of the client and delivery teams' aspirations.

Thought-out asset delivery, information from the RADAR reports aided the asset delivery team with their knowledge of the current project issues and informed the traditional risk register. Following completion of the project, three specific RADAR questions found as being statistically relevant for finding and evaluating the emerging issues and risks. These related to team collaboration, team communication and achievement of personal aspirations on this ground-breaking facility.

For the TEC a standard risk profile would not have picked up the spikes in cost concern so early. This is in comparison to traditionally plotting a risk profile over time (which because of the gradual gain in risk information during project duration) produces a smooth line curve of opportunity to influence project outcomes from greatest influence at scheme concept design to least influence at handover.

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The key points highlighted in the TEC- RADAR Risk Review above show the early warning found by the RADAR Panel.

During asset delivery the early warnings gave the asset delivery team the opportunity to discuss and resolve the emerging issues within each stage. Uncovering of the issues and discussion of them in an open and honest environment allowed the asset delivery team to put in place proper risk mitigation measures and acted as a safety net against the burying of the issues as risks and pushing them down the supply chain only to come back up the supply chain as conflict and potential cost overruns.

Research Conclusions

The above TEC-RADAR output has generated a post asset delivery model that analyses contemporary data used in the collation & identification of risks. The month by month data processed during asset delivery of the asset was collected in real-time. The trends shown are a summation of the individual trends produced in response to the RADAR questions asked of the wider project team during project execution. During asset delivery the responses to these questions facilitated corrective action by the project leadership to key issues raised through reviewing the trends of responses to individual questions. Where feelings worsened this acted as an early warning system.

For this post asset delivery research, various "snapshots" were taken of key issues arising during asset delivery. Three are shown: 'Alignment of Expectations', 'Post Close Alignment' and 'Production Risk Mitigation'.

Research findings show in the TEC- RADAR Risk Review lead indicators of the key issues appearing at the time. From post asset delivery research these key issues show a dip in the graph of worsening feeling. These dips in the graph are an early warning from the wider project team of an increase in impending risk. Project risk feeling fluctuated during asset delivery as individual personal feelings flowed downwards with pessimism of risk occurrence increased and upwards with optimism of risk mitigation. This flow of feeling accurately predicted the real-time profiling of ongoing project risk.

Acting as an objective and unrestrained risk capture mechanism the research proves that RADAR enhances the identification of unforeseen risks and emerging trends. Further the research shows that RADAR analysis both during and after reporting highlighted inter and intra party differences. The research also shows a correlation between standard risk management techniques and the RADAR techniques.

It was the team culture than prevented the contract being called on acting in the true spirit of collaboration. However it is noted that the operation of such an early warning system could readily have been enhanced had it been fully integrated into the contractual NEC Early Warning processes.

The original intention was simply to compare RADAR results with the cost or cost variance trends for the asset delivery. However, neither cost trending nor cost variance trending is a good indicator of overall risk as both ignore the impact of time and quality of asset delivery.

The behavioural based approach aligns statistically with more established standard qualitative risk management techniques. Building on the more standard risk identification techniques of brainstorming and interviewing RADAR gives real-time issue identification and collaborative stakeholder feedback. Of key importance are the differentiators of confidentiality and above

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all else complete and guaranteed anonymity allowing unconstrained and unrestricted reporting of issues or risks of concern known only to a project participant.

Graphically the research shows that the benefits of RADAR are throughout asset delivery and achieve far more than a stabilising management system supporting early warnings during the actual construction phase of asset delivery.

Working with the attributes of participant anonymity, structured information flow, and simplicity of feedback and finding risks objectively and independently, RADAR supports the need of infrastructure investors to find and control issues through enhanced de-risking of construction by the finding of risks objectively and re-evaluating them by construction team members. The proposition is enhanced by found risks being objectively and independently re-evaluated by team members and new previously unfound risks proven and evaluated through risk analysis independently moderated by external experts.

The NEC contract form facilitated the UEA's ambitious project and promoted the open collaborative dialog that was necessary to understand and quantify the commercial risks. One lesson learnt was that the operations of the NEC processes became hindered by the supply chains inability to price these risks at the earlier stages. The client was open to experimenting yet remained sufficiently pragmatic to maintain the collaborative ethos in the face of commercial challenges.

The independent investor view is that ***"The ResoLex RADAR reports provided us with real insight into our scheme. The reports added value by enabling us to tackle issues early, giving us on average 6-9 months warning, thus reducing conflict and ultimately saved us time and money."*** Professor John French, CEO and Project Director Adapt, Chair of Enterprise and Sustainability at University of East Anglia.

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UEA Project Manager

Patrick Watson B Eng (Hons) DipCSM C Eng MICE MAPM is a founder and Partner of niche independent consultancy 3PM, which specialises in the field of portfolio, programme and project management. He is an engineer by background with over 30 years' experience and has worked on a number of multi-million-pound projects throughout the UK and overseas. These include Wembley National Stadium, Colchester Garrison PFI and more recently on significant schemes across the University sector including the £142m Paul Marshall Building for LSE. Recent project awards have included the BCO "Best of the Best" and Best Corporate Workplace for a unique Passivhaus scheme for University of East Anglia.



He specialises in the early stages of the project life cycle and is a recognised expert in the field of risk management. He is a founding member of the Higher Education Design Quality Forum (HEDQF) and panel member of ResoLex RADAR delivering a cultural change in the management of risk, dispute and behavioural dynamics.

As a qualified NLP Practitioner he is able to focus on the softer aspects of project team relationships, inspiring a trusted relationship with the key parties so that the true issues can be resolved. His experience and style makes him adept at problem solving, utilising the available resources with a clear preference for hands on involvement. His approach utilises his acute inter-personal, communication and leadership skills along with a high level of enthusiasm and motivation to provide and ensure total client satisfaction. His strength lies in his ability to motivate and influence large numbers of people, all who have different needs and business objectives.

Above all he remains a practicing Project Manager who enjoys the satisfaction of leading projects to successful conclusion. His focus and passion are delivery of complex projects.

RADAR Panel Members

Richard Bayfield BSc (Hons) MSC CEng CEnv FICE FCI Arb is currently working at board level with several high-profile clients helping to deliver major capital projects and development programmes. In 2006 he was appointed to the construction minister's sounding board of 6 "key industry figures" who advised on proposed changes to construction industry legislation. He was a member of the Adjudication Panel for the London 2012 Olympics. He is a former Chairman and now Honorary Member of the Society of Construction Law.



He is a chartered Engineer and a chartered Environmentalist. He also holds a master's degree in construction law from King's College London. His career includes considerable Major Project experience at all stages from pre-planning to final account dispute resolution.

His major project experience began on the Thames Barrier with Costain. His experience of collaborative working at Honda's £multi-billion development in Swindon has influenced much of his current work, and resulted in Honda receiving a British Construction Industry Award

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(BCIA). He co-authored a paper analysing the 40% construction savings made by Honda. The award judges noted Honda's collaborative culture of openness and transparency as being a key element of their success.

Recent roles included working at Board level with Temple Group consultants on major infrastructure projects including HS2 and with University College London on several £multimillion biomedical science developments including the multiple award winning £100m Sainsbury Wellcome Centre.

He has acted as Adjudicator on over 50 construction disputes since 1996. He recognises that because many disputes have a similar format and pattern, there is a great opportunity to use this knowledge as part of a client's strategy of dispute avoidance. He sees Neutral Risk Monitoring/ RADAR as a key tool to help client organisations to improve governance procedures and mitigate risk.

Stephen Woodward FAPM has an expertise in risk management that began when working on contractual strategies as a quantity surveyor (formerly qualified as FCIOB) for major contractors where he saw risk passing down the supply chain and returning as conflict. His role at the time was to generate contractual claims to redress buried risk.



Influenced by the openness of pure construction management adopted by visionary project principals of the 1980s he changed direction and was commercial director at a Japanese multinational developer where he promoted upfront risk identification, fair risk sharing and the pioneering use of project mediation (he is a CEDR Accredited Mediator) to reduce cost overruns.

In the early 1990s while working with the UK's leading construction project funder he expanded independent monitoring from a cost review to a service focused on risk including time, cost, quality, and project management at the interface of construction and finance risk. This service was the forerunner of today's construction industry's bank monitoring service. For two decades he acted as construction risk advisor to project sponsors, funders and investors and UK government office.

His interest in human behaviour (he is an NLP Master Practitioner) particularly in the areas of principled negotiation and conflict avoidance though the early resolution of disputes together with the human dynamics of construction risk management and early warning systems led to his membership of the team that created RADAR as a tool of risk management.

The Enterprise Centre

About the building

The Enterprise Centre is an exemplary modern teaching and working environment, characterised by plentiful natural light, excellent ventilation and indoor air quality, and an intimate connection with the historic Earlham Park and reflective Memorial Gardens.

This highly ambitious project conceived by the Adapt Low Carbon Group meets the highest energy and environmental standards. Designed by sustainable architects, Architype in collaboration with single-point deliverer Morgan Sindall, The Enterprise Centre is a thriving community where businesses and students work side by side.

A leading business hub in the region, entrepreneurial spirit and collaborative working are at the heart of what we do. As well as providing a range of tenancy options, the building is an innovative and inspirational location for meetings and events. Building on founding principles of knowledge sharing and supporting businesses locally.

While its timber frame and straw cladding have been specified to minimise embodied carbon and promote the use of renewable materials, the bold, crisp and contemporary design has been influenced by the strong and confident modernist lines of Sir Denys Lasdun's Teaching Wall and Lord Foster's Sainsbury Centre for Visual Arts.

Sustainability

The Enterprise Centre is one of the UK's most sustainable buildings and is the first large scale building in the UK to target both Passivhaus Certification and BREEAM Outstanding, two of the most sustainable rigorous built environment standards.

Passivhaus provides a methodology to significantly reduce the energy requirements of a building whilst maximising thermal comfort and air quality.

BREEAM sets the standard for the best practice in sustainable building design, construction and operation and has become one of the most comprehensive and widely recognised measures of a building's environmental performance of which The Enterprise Centre has achieved BREEAM Outstanding (the highest rating).

Materials

The Enterprise Centre has minimised the emissions associated with construction through the use of natural and recycled materials:

Foundations:

Sub-base aggregate: recycled aggregate from the demolition of St Andrew's Hospital, Thorpe St Andrew, near Norwich

Isoquick insulation: Polystyrene ground floor slab shuttering system.

Cement: 70% replaced with ground granulated blast slag (a by-product of iron and steel making industry)

Reinforced steel: 98% recycled

Diamond polished floor: Replaces the need for carpets and lowers the carbon content of the building over its lifetime

Interior materials:

Ceilings - SonaSpray: this is both decorative and a sound absorber. It is a mixture of PVA glue and 85% recycled paper which is mixed and then blown onto the ceiling.

Timber frame (interior) - Austrian glulam beams make up the main timber frame. Glulam (laminated beams) are a natural alternative to concrete or steel. Glulam is a natural structural material that is both economical and strong.

Studwork - (the supporting framework) 70% of which has been made from Corsican Pine from Thetford Forest.

Insulation - Warmcell: Waste paper converted into a high performance cellulose fibre insulation.

Exterior materials:

Mediterranean Tricoya - Cladding panels to external facades. External grade Medium Density Fibreboard (MDF) with a high performance resin and zero added formaldehyde.

Flint - Locally sourced from Holt, Norfolk.

Timber frame (exterior) - UK glulam beam that supports the canopy at the front of the building. Made from larch from Brandon, Suffolk and engineered at Inwood in Lewes.

Thatch for Clerestory lights - Reed from Southwold in Suffolk. Thatched in the same way as a traditional domestic house.

Thatch for wall panels - Straw from North Norfolk. This is an innovative cassette panelling system that uses 343 cassettes. The Enterprise Centre is the largest exterior thatched building in Europe.

African Iroko (outside wooden panels on roof terrace) - Recycled from original UEA chemistry lab benches. The benches were sent to joiners in Norwich, planed, divided and then installed.

Local Oak – oak used as cladding beneath the revolutionary thatch panels, sourced from one oak tree from Somerleyton Hall Estate, Norfolk. The tree was felled 20 years ago after storm damage and left in a local lumber yard.

Facilities

- A range of flexible rooms and inspirational spaces for hire from meeting rooms for 4 people to a 300 seater lecture theatre and stunning roof-terrace.
- Tenancy - co-working, hot desks and virtual
- CPD accredited tours of The Enterprise Centre

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Funders

- European Regional Development Fund
- University of East Anglia
- Biotechnology & Biological Sciences Research Council
- The Building Research Establishment