



SURVEY REPORT:
**THE BUSINESS
BENEFITS OF
IP PRODUCTION**



Enabled by



The Context

In Board rooms all over the world right now there is talk of a move to IP – or ‘Internet protocol’ – working. And all over the world technologists are leaving those Board rooms still dripping from the cold water poured on them by Finance Directors and CEOs.

The meeting probably went wrong the moment one of those executives asked the dreaded question: ‘what will be the return on our investment?’

The move to IP based working is one of those every-decade-or-so infrastructure changes that everyone knows is inevitable, but few can explain when, how – or possibly even why. As will become evident from this report, the long term benefits of IP production are irrefutable: it is the technology the media industry requires to enable its never-ending appetite for greater quality, scale, speed and value.

But that’s unlikely to be an answer that will cut much ice right now with the Finance Director. She or he will want to know more precisely which applications of IP technology are going to offer the greatest benefits, to whom and when. And will those benefits be cost savings; cost avoidance; creative benefits or competitive advantage?

Time and again at the DPP we have found ourselves being asked what the benefits of IP production actually are. It’s a question made all the more difficult by the wide range of meanings given to the term. ‘IP production’ covers such a broad range of activities it has become almost meaningless, much like ‘digital.’

So to answer the questions regarding both benefits and definition, we have spoken to experts from across the media industry – people who are working in areas directly impacted by the introduction of IP technology. The results of those conversations are presented here.

The Approach

This DPP survey was generated from a combination of workshops and individual interviews.

Our first workshop, with DPP Members, generated an Impact Map of the activities in the production process that are expected to be affected by IP technology between now and 2022. This map can be seen on page 11.

Interviews were then undertaken with a number of expert individuals whose work reflects different parts of this map.

Finally, a second DPP Member workshop was convened in which the evidence from those interviews was shared. This workshop helped us to refine our understanding of the evidence, prior to the preparation of this report.

In assessing the evidence on benefits we have adopted the following scoring system. Inevitably it is subjective. But taken together the scores help us triangulate timing, benefits and investment.

🕒 TIMING

Now	Deployments already exist
Next	Deployments will be happening within the next two years
Later	Deployments will happen in two to five years
One Day	Deployments may happen, but in more than five years time

★ FINANCIAL BENEFITS

Low	Difficult to quantify, or marginal
Medium	Can be quantified and represent several percentage points of cost saving or avoidance
High	Highly significant, and above 10% cost saving or avoidance

OPERATIONAL BENEFITS

Low	No change to workflows, or simply replaces one process with another
Medium	Makes things easier, although not profoundly different
High	Game changing: the opportunity fundamentally to improve how things are done

CREATIVE BENEFITS

Low	Simply different, but neither noticeable to a consumer, nor a brand differentiator
Medium	Enables some value-add either to a business user or consumer
High	A major innovation, visible to a business user or consumer, and offering market differentiation

INVESTMENT COSTS

Low	Cost neutral
Medium	Some investment cost, requiring local level sign off
High	A significant investment decision, requiring Board level sign off

In assessing overall business benefit from these scores, we have taken timing rated as 'now', together with benefits that are high and investment costs that are low as the greatest level of business benefit.

The lowest level of business benefits would be a capability that will manifest in more than five years time, with low benefits and high investment costs.

The DPP is extremely grateful to the following companies that have contributed their insights to the process.



ARQIVA



BASE MEDIA CLOUD



BBC



BT MEDIA AND BROADCAST



BT SPORT



CENTURY LINK



CHANNEL 4



DELUXE



DOCK10



EDITSHARE



EQUINIX



ERICSSON



GLOBEGIG



GREEN ROCK



HACKTHORN INNOVATION



HONEYCOMB



IMG



ITV



M2A MEDIA



NORTH ONE



OOYALA



PAC-12



PIKSEL



PINWOOD



PRIME FOCUS



SAM



SKY



SONY



TELESTREAM



TIMELINE

Although this report reflects the thinking of experts from these companies, it should not be assumed that everyone who took part in the survey subscribes to all the views presented here.

Defining IP production

Perhaps the greatest reason for confusion in how people use the term 'IP production' comes from the industry's use of IP in two different realms: live production and non-live production.

In live production Internet Protocol is a means of moving audio, video and data signals. In this environment IP is a distinct means of production, with its own specific characteristics. In non-live production Internet Protocol is a means of moving files. In this environment IP is simply a means of transport for content – although a means of transport that opens up very different ways of working.

The different use of IP in live and non-live contexts is explained in more detail below.

IP in live production

The signal in a live production requires a continuous path from a studio or event, to a production gallery, where it is manipulated, before being distributed live to the audience with as little delay as possible. This movement and manipulation of signals is principally what differentiates live production from non-live, where the activity is focused around the movement and manipulation of files.

STAGE	LIVE	NON-LIVE
Content Acquisition	Live sound and vision signals sent to a production gallery or outside broadcast vehicle from studio or event venue via direct cabling, wireless links, telecommunications circuits or satellite	Sound and vision recorded as data files on memory cards and transported to base or post production facility physically or via the Internet
Content Production	Live mixing of sound and vision feeds, graphics and inserts in gallery or vehicle	Editing and finishing of files in post production
Content Distribution	Live signal sent to playout, or direct to an OTT platform	File delivered to playout or uploaded to an OTT distributor

Live production relies heavily on technologies that help cope with a high volume of signals and information in environments where precision timing is essential. The best known technology for achieving such precision is the Serial Digital Interface (SDI). SDI has been around since 1989. It is a family of standardised interfaces, and, in effect, it wraps content in a way that makes transport and interconnection with other SDI based interfaces guaranteed.

With the arrival of new, IP based technologies, SDI will slowly be phased out. The reason for this is not that SDI is fundamentally inferior to IP. Indeed, when it comes to resilience, robustness and lack of delay, SDI is in many respects still superior. But the strength of IP is that it promises to improve the flexibility and responsiveness of live production – in ways that are profound.

The easiest way to understand the potential of this change is to consider three elements in the move from SDI to IP:

- 1 Using IP networking rather than traditional broadcast cables to deliver audio and video signals, and manage studio production, over a much smaller number of connections.

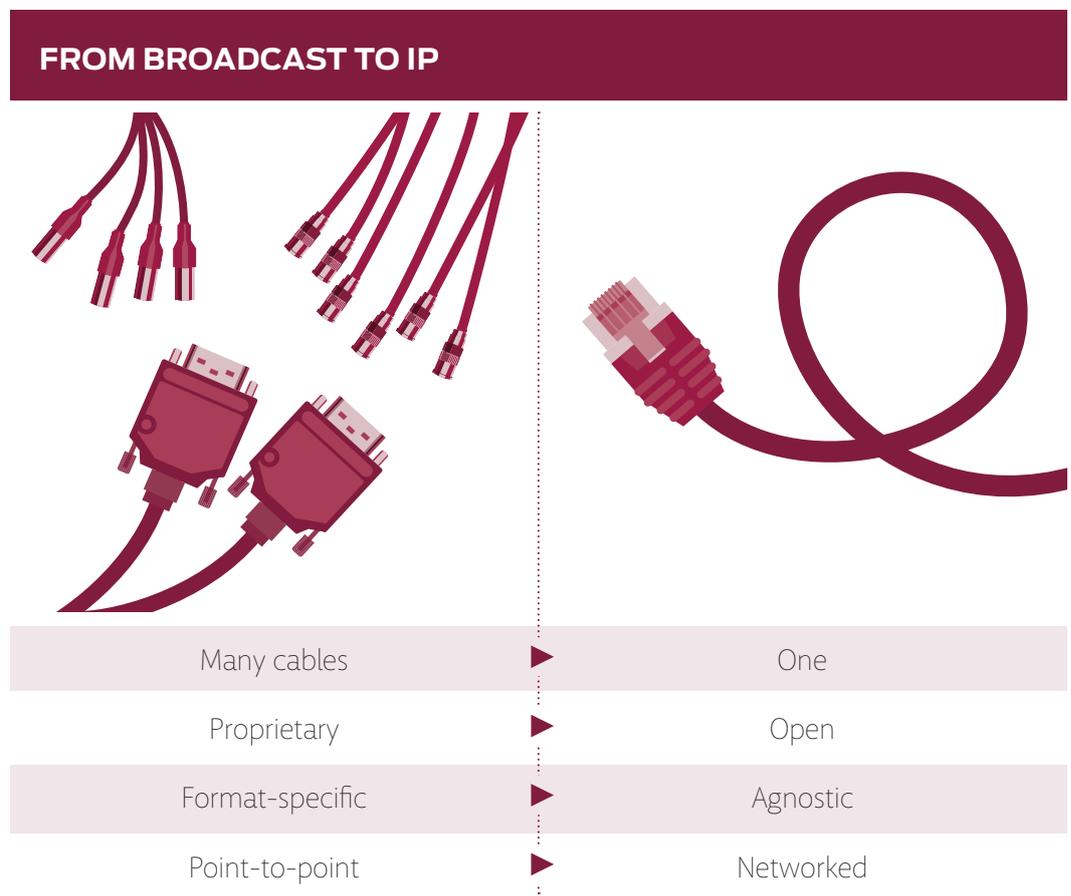


FIGURE 1:

The difference between traditional cables and an IP cable

- 2 Moving onto an IP network can unlock the potential for greater flexibility in how people and resources are allocated in production workflows – especially for outside broadcasts (OBs).

FROM OB TO IP PRODUCTION

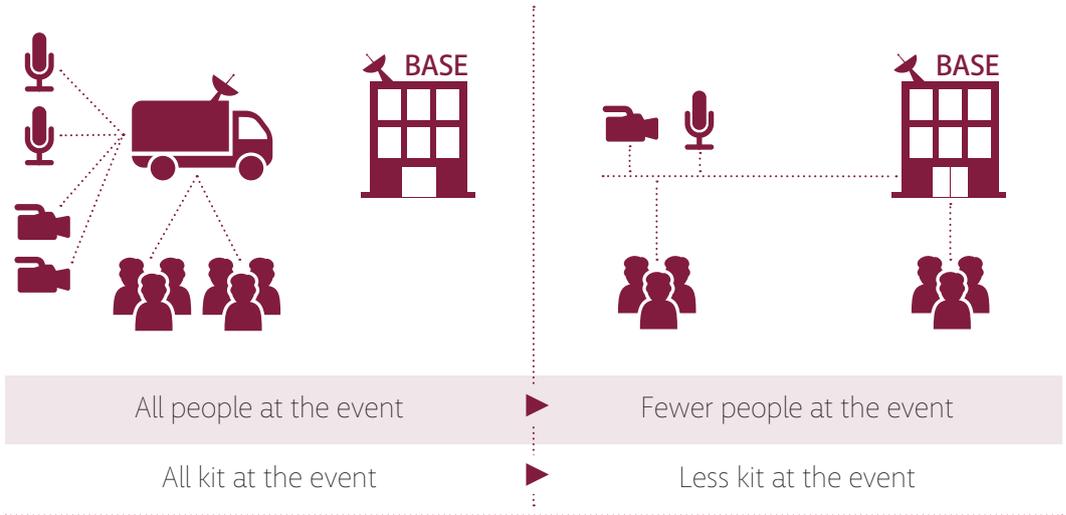


FIGURE 2:

The move from traditional OB production to IP production

3 The ability to centralise common services that can support multiple productions.

TRADITIONAL TO CENTRALISED

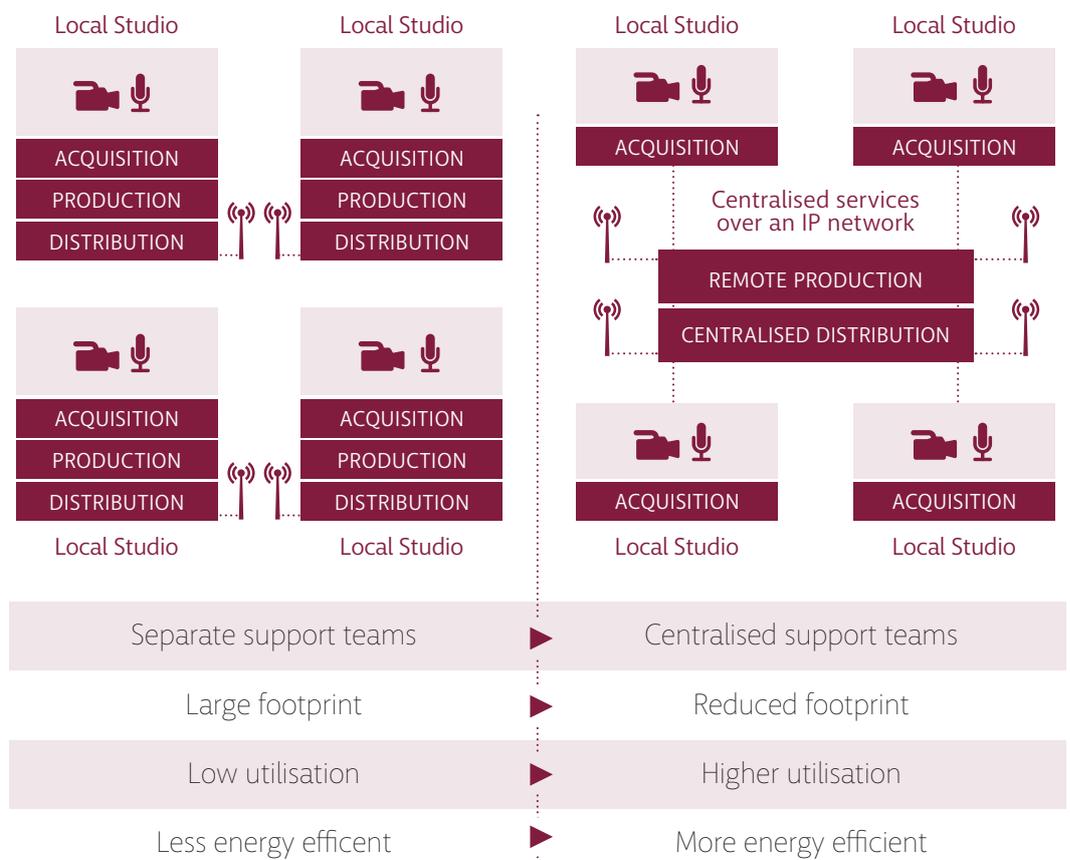


FIGURE 3:

The key differences between traditional and centralised production services

As can be seen from these three illustrations, the flexibility and responsiveness of live capture and production looks set to be greatly increased by the use of IP – whether by using existing IP networks or installing new ones.

IP in non-live production

In some respects the DPP led move to file based delivery means that almost every production and post production company now has an element of 'IP production': they deliver their finished programme as a computer file over the Internet to a broadcaster.

Non-live content has been captured and shaped in digital file format for several years. However for so long as programmes were delivered on the physical medium of videotape the production sector largely avoided Internet based services and production tools. With file delivery everything changed. In an entirely file based production world new digital services logically replace physical ones; and those digital services are increasingly offered via connected or Internet based technologies.

Much like live capture and production, non-live IP production operations offer flexibility, speed and responsiveness. Production is a famously 'peaky' activity: teams are brought together and dispersed quickly, and in different configurations. Different types of production, and different key talent, require different tools. IP based working appears to be a more effective means of managing such a variable demand for resources.

The key characteristics of IP led production are often said to be:

- software leased for as long as it's needed – one day, one week or one month (often referred to as 'software as a service' or SaaS)
- rented cloud infrastructure: storage and processing power, that can scale up and down as required
- the use of IP networks to allow talent to work from anywhere.

This service based approach is of course reliant on good connectivity. So although IP led working can offer a new way of thinking about production, it may lack the connectivity to make it possible. There is a distinction therefore between IP based non-live production as a way of working (a service led, distributed and flexible approach to production), and IP based non-live production as a practical capability.

Of course, the Internet is also used as a means of distribution. It is easy to argue that from a consumer point of view there has been enormous benefit to Internet distribution, since this has been the mechanism for video on demand and video on the move.

This survey report does not focus on the consumer market in the use of IP in media. The attention here is upon the production, rather than consumption, process – although the lines of course become blurred with live content that may go directly over the Internet from the producer to the consumer (Facebook live from a mobile phone for example), and for non-live content that is produced for delivery direct to online platforms.

IP Impact Map

The division of production into live and non-live is a helpful shorthand for describing two very different applications of the term 'IP Production.' But of course the reality of how content is created, managed and supplied to a distributor or directly to the customer is far more complicated than that.

The Impact Map provided here attempts to capture some of that complexity. It shows, for example, which activities in the production journey relate to live production, or non-live (pre-record) or both. The map may not be exhaustive, but it provides a good guide to aspects of production that are currently – or are likely within five years to be – impacted by IP technology. It also provides a useful overall map for much of the discussion in this report. The left hand side of the map shows activities which relate to specific moments in the production process. On the right hand side are activities which straddle more than one part of the production process.

Areas impacted by IP technology by 2022

ACQUIRE

LIVE & NON-LIVE

Camera with IP output
Camera with wireless & file transfer

NON-LIVE

Store and forward devices
Rushes back to base
Rushes review tools
Call sheets, shot lists & location data delivered to mobile

LIVE

OB (scanner, IP satellite or IP fibre)
User generated content
3G/4G bonding and delivery
Remote production
Other data e.g. sports data
Comms (talkback)

NON-LIVE

Remote Grade

LIVE

Graphics Data

LIVE & NON-LIVE

High Frame Ratea (HFR)
UHD | HD | HDR
Business Messaging Receipt
Broadcast centre IP infrastructure

NON-LIVE

Cloud enabled global workforce e.g. vfx houses
IP post production

LIVE

IP satellite newsgathering services
Private cloud based SDI & IP processing
Master Control Room (MCR)

LIVE & NON-LIVE

Security
DDOS & other cyber attacks
Scalability
Metadata delivery
Monitors & players
Software as a service
Software defined networking
New industry standards
Virtual UID
Object based IP services

SHAPE

LIVE & NON-LIVE

QC in the cloud
Captioning and subtitles

NON-LIVE

Remote edit tools
Executive & remote review

LIVE

IP mixers
Configuration as software (Multiple microservices)

DELIVER

LIVE & NON-LIVE

Central Coding & Mux
Live & non-live audience interaction
Access services
Business data interaction (e.g. UID delivered links to payments)

NON-LIVE

IP delivered content files (programmes, commercials & promos)

LIVE

Live data injection

DISTRIBUTE, CONSUME & ARCHIVE

LIVE & NON-LIVE

Apps for the web
Consumer devices
OTT delivery
Content watermarking (dynamic insertion & tracking)
Personalised advertising
Geoblocking & global delivery
Content Delivery Network (CDN)
Audience insight
Version control & archive

NON-LIVE

On demand video

LIVE
IP monitoring of streams
Web first content
Player quality monitoring
Live advertising (content or data)
Return channel

LIVE & NON-LIVE

Digital Rights Management (DRM)

LIVE & NON-LIVE

Business continuity & disaster recovery

The business benefits

Business benefits in media very rarely relate to innovation in a single process, technology or piece of equipment. Benefits are almost invariably associated with changes that are made to a significant part of a production environment.

In assessing the business benefits of IP production we have therefore divided the discussion into 10 broad areas, which describe key environments or contexts in which IP will have an impact.

MULTI CAMERA SHOOTING

SINGLE CAMERA SHOOTING

EVENTS COVERAGE

LIVE STREAMING

OBJECT BASED MEDIA

MANAGING PRODUCTIONS ON LOCATION

POST PRODUCTION

MEDIA MANAGEMENT

CLOUD PLAYOUT

IP DISTRIBUTION

MULTI CAMERA SHOOTING

IP for shooting (or acquisition, as it is often now termed) can mean four different things:

- An IP camera – one that outputs in a high quality IP format
- Contribution of content over IP from a camera that may not itself be IP based
- SDI feeds from multiple cameras converted to IP in an OB vehicle or gallery
- The use of IP to control cameras remotely

These different variants are covered by two production scenarios: multi camera shooting and single camera shooting. This first section considers multi camera shooting.

There are as yet very few native IP cameras – that is, cameras that output via IP. Those that do exist, output a signal using compression – though, somewhat confusingly for non-technologists, it is a form of compression that is referred to as ‘visually lossless’. So while there are currently no cameras available with uncompressed IP output, the ones that do exist can nonetheless output very high quality images.

In time, native IP cameras – although of no particular benefit in isolation – could become very beneficial as part of a full IP production chain. Once plugged into an IP network, the output from the camera could be accessible by anyone from anywhere with access to that network. In a very large set up, with a huge number of cameras, this could become extremely useful.

“ If you had a native IP camera you could plug one fibre into an OB camera and the production can get that camera feed in any gallery anywhere in the country, almost instantaneously. Normally when you specify a studio or OB truck you start with a limit to the number of cameras. And if someone says ‘I have 101 sources’ you have to start thinking hard about how you will do it. But in a fully IP world there isn’t really a limit.

DANIEL MCDONNELL
MANAGING DIRECTOR, TIMELINE TELEVISION

In reality however, multi camera shoots are already beginning to gain this benefit by taking the outputs of current, non-IP cameras and converting them to IP signals. Suddenly outside broadcasts are released from having to plan for OB vehicles that can only handle a certain, pre-defined number of cameras. Now cameras can be added to a single OB vehicle, or to a production gallery, as required.

It is sometimes suggested that such set-ups could go a stage further with the deployment of fully automated (or robotic) cameras, feeding back to a single, remote production gallery. Automated and remote controlled cameras already exist of course – most notably in news studios. The opportunities on location are more limited. The camera would still need to be rigged; and in practice there are few location shooting situations that are so predictable and formulaic that robotic cameras alone would reliably capture the action.

There are two scenarios in which robotic cameras may nonetheless be introduced. One is to provide supplementary footage as part of a large scale multi camera set up. The other is at the other extreme: in low cost coverage of minority sports or specialist events, for niche audiences, where the primary cost saving is in reducing the number of people required on site.

The benefits of IP led multi camera live event coverage are therefore potentially considerable. There are cost savings in the deployment of fewer vehicles or galleries; there are creative benefits in being able to expand coverage quickly and easily; and the overall technical infrastructure will be more lightweight.

Having said this, the trend in media is always towards more and better. It is likely that any cost benefits will be offset by the increase in scale that the technology enables.

There is one note of caution regarding discussion of the introduction of IP technology into multi camera shooting. It is an innovation that will always attract attention at broadcast trade shows and other major industry events – partly because it represents IP production at its most pure, and most exciting; and partly because, by definition, it relates to the biggest, highest profile broadcast events. But while such productions command enormous budgets, and are often related to eye-watering rights deals, they represent a small portion of the overall content creation ecosystem.

So IP production in this context may be attention grabbing; but it is not typical. Only a tiny proportion of production companies will ever be involved in events such as these.

BENEFITS SUMMARY

🕒 Timing	NOW & NEXT	💡 Creative benefits	MEDIUM
★ Financial benefits	MEDIUM	£ Investment costs	HIGH
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	MEDIUM

SINGLE CAMERA SHOOTING

The impact of IP on high end single camera shoots, such as drama, has been around rushes management rather than the shooting itself. Similarly, in documentary programme making IP offers a means of returning rushes to base, and of accessing them via cloud services (see the DPP's **10 Things You Need To Know About Location Workflows**), but makes little difference to the act of shooting itself.

The impact of IP production in journalism however has been dramatic.

“ In live terms IP has revolutionised services: journalists can deliver direct to online from the field – can update Facebook, have access to emails, the Internet, intranet, internal and external apps, and so on.

CHRIS PERRY
SPECIALIST ENGINEER, BBC

If we define IP based contribution as including the use of Wi-Fi hotspots, 3G and 4G, line bonding services and so on, then 'revolution' is not an overstatement. The ability for journalists to file stories over the Internet has made journalism more agile and lightweight. It has enabled cameras to access places – and therefore stories – they simply couldn't reach before – or at least couldn't reach and then file from immediately.

The spectrum of contribution technologies is huge, ranging from expensive, managed links right down to the smartphone.

IP contribution can be dramatically cheaper. The cost of IP satellite kit is 1/10th the cost of a traditional Ku satellite uplink kit; and the cost of a mobile data SIM is 1/10th the cost again.

This is a content gathering world in which there are constant trade offs between cost and risk: if the chance of a major scoop brings with it the risk that the link will go down live on air, there may nonetheless be a decision to give it a go. If, on the other hand, the story is a presidential inauguration, then it is likely a resilient, expensive means of contribution will be secured.

Journalism is well suited to such judgements. A news studio can move to the next story if there is a hiccup. A sports studio can't respond the same way to missing the touchdown that won the Super Bowl. Nothing better expresses the extraordinary range of production contexts and corresponding technology needs than such a juxtaposition. The strength of IP based contribution methodologies is that they can service the entire range, in a way that SDI based technologies cannot.

BENEFITS SUMMARY

🕒 Timing	NOW	💡 Creative benefits	HIGH
★ Financial benefits	HIGH	£ Investment costs	LOW
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	HIGH

EVENTS COVERAGE

The coverage of events – often referred to as Outside Broadcasts – is an extension of the multi camera shooting scenarios discussed above. But we are now considering the whole environment – from shooting, to shaping the video and audio in a truck or gallery, to then sending the output or outputs to a distribution hub for onward delivery to the consumer.

This is a production context in which we are seeing IP based working starting to have a significant impact. But it is a complicated picture, with the use of IP varying greatly, depending on the exact environment and the event being covered. Once again the balance between cost and risk is finely tuned.

The most significant use of IP around events is where locations are used regularly (such as major sports venues, concert halls, conference centres and so on). Increasingly either broadcasters or the venue owner themselves are making the investment in IP infrastructure and Internet connectivity. The purpose of this is to transport the mixed output from the event back to base for distribution, or direct to the audience.

There are also significant production benefits to using Internet connectivity at a venue. It provides a single solution that will work for all services – video, radio, interactive, Internet services, and so on. It enables the extension of workflows that would normally be found in a studio out to the field: teams can access corporate networks, and get access to libraries, shared folders and other services. The walls of the production entity are, in effect, extended out to the location. This may also mean that fewer members of the production team are required on location.

An IP based truck or location production gallery doesn't in itself deliver higher quality content than one based on SDI, but it will enable the delivery of more feeds, better management of the infrastructure, and the move to higher resolution video. It will also be able to deal more easily with the ever increasing quality of video material. In an IP world, the move to 4K, and then inevitably to 8K, does not require an infrastructure upgrade each time; it is simply a matter of handling more data. Format changes such as this just become a network capacity question. Indeed, from the point of view of those who already manage UHD delivery, it is no longer possible to produce in the quality required for modern sporting events without the use of IP. IP gives them the ability to respond to increasing quality, as well as flexibility and scale.

“ Our new IP based OB truck will do 4K replays as well as supporting 4K cameras. If you want to do that in traditional SDI, then good luck! It would take a lot of kit and be vastly more expensive. When the time comes to go to 8K it will just be about switching data down a port. And to give a sense of the scalability IP allows, a multiviewer which traditionally has about 50 or 60 wires now, in an IP world, has just two fibres and allows you to show 48 sources on 12 different screens over those two wires. So if someone says ‘can I have another multiviewer for this really big show’, you get one off the shelf, plug in two wires in and have 100 sources.

DANIEL MCDONNELL
MANAGING DIRECTOR, TIMELINE

But this capability currently requires huge investment. Most OB operations are currently an SDI/IP hybrid, with considerable effort and expense going into equipping and managing the conversion points.

Nonetheless even hybrid models can deliver benefits. Pac-12 Sports Network covers a range of college sports. They broadcast around 850 events a year. Currently around half of these send all the audio and vision back from location over IP to a central production hub in San Francisco, where the output is vision mixed and distributed. It is a far more efficient way of scheduling people and resources across a wide range of events happening at a range of venues and times.

It's a way of working that Pac-12 finds 18-25% cheaper than the traditional model. The next place to go would be a full Network Operation Centre in the cloud. But that leap is felt to be at least three years away.

There is also a skills conversion taking place – bringing together the skills of broadcast engineering and IT. In time that shift will make IP based events easier to support. Software diagnostic tools can identify issues to a granular level – and even see faults beginning to emerge before they are apparent to the human eye. This pre-emptive problem management will represent a significant benefit.

But currently the world of media finds it hard to attract individuals with the necessary skills:

“ There is still a tall fence between what happens in TV and what happens in Silicon Valley. We are based in San Francisco – which at least is physically near to Silicon Valley. But even then people look at us and say ‘I don’t want to work for TV; I want to work for Uber. You’re a dead technology’.

MICHAEL HARABIN
VP TECHNOLOGY, ENGINEERING AND MEDIA MANAGEMENT, PAC-12

“ Our technical operations team is now a converged team of IP and Broadcast engineers. But it has been a difficult journey. The transfer of knowledge is hard – even the very terminology used is different. A ‘big file’ in the IT domain is nothing like a ‘big file’ in the Broadcast domain where they are simply huge! And in the usual IT environment things are ‘set and forget’. But in broadcast production needs constantly change as each team comes and goes, with each needing their own bespoke arrangements. It’s a whole different operational technique.

PAUL CLENNELL
CTO, DOCK10

BENEFITS SUMMARY			
🕒 Timing	NOW, NEXT & LATER	💡 Creative benefits	MEDIUM
★ Financial benefits	MEDIUM	💷 Investment costs	HIGH
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	MEDIUM

LIVE STREAMING

Live streaming has brought a whole new meaning to ‘outside broadcast’. Live streaming involves sending the output from a single camera, or multiple cameras mixed through a vision mixer, to an online platform, such as YouTube, Facebook, Twitch or Snapchat, or a content producer’s own website.

It is difficult to assess the consumption of these services, since each platform measures differently, and the live output often becomes immediately available as video on demand. But however one looks at the figures, views can be in the tens of millions: these services are hugely popular.

And as the popularity increases, so does the professionalism of production. There are now companies that specialise in providing ‘mini-OBs’ – low cost, highly mobile multi camera coverage of events. They use SDI cameras, but convert the signals to IP. This is increasingly done by a Network Device Interface (NDI) – an open protocol designed to enable video products to communicate, deliver and receive high quality video, with timing and accuracy that’s suitable for switching in a live production environment.

This hybrid production culture – somewhere between a TV outside broadcast and user generated content – is premised upon the deployment of small teams, using lightweight equipment.

“ The crew is typically five people. With everything scaled down – thanks to the technology – you can do more. I train everyone up on different stations so they can work flexibly. If anyone is ill the operators can do more than one role. Meanwhile the kit is getting smaller and easier to transport. Sometimes the crew keep it at home to save time on travel and moving kit about.

STEVE SHARPLES
DIRECTOR, GLOBEGIG

Despite the increasing professionalism of live streaming productions, resilience is a challenge. Small satellite vehicles are sometimes now used as a backup. The key question for the established broadcast community is whether they are willing and able to operate in this market – both culturally (do they understand the audiences for live streamed content?), and in terms of quality of delivery. Pressure on budgets, together with growing competition from the mini-OB market as 5G and high speed broadband roll out grow, might give them no choice.

BENEFITS SUMMARY

🕒 Timing	NOW	💡 Creative benefits	HIGH
★ Financial benefits	HIGH	£ Investment costs	LOW
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	HIGH

OBJECT BASED MEDIA

The ultimate version of IP production is object based media – also sometimes referred to as componentised media.

Many consumers will experience (although perhaps be unaware of) responsive design, which presents online experiences differently, depending on the device being used. So a website will look different on a smartphone compared to a laptop. Object based media is in some respects similar. It takes all the components that go into making content – video, audio, graphics, metadata – and delivers them to the consumer separately so that they can be customised to their viewing device, location and preferred experience.

The consumer might appreciate such customisation because of the environment they are in – perhaps it is noisy, so they would like to make the dialogue stronger in the mix. Or the consumer might have accessibility needs: if they are visually impaired, for example, they might appreciate a clearer, bolder version of the graphics. Or the customisation might be out of personal taste: perhaps the consumer would like to overlay the pictures from one sports broadcaster with the sound from another and the graphics from a specialist graphics app.

Some regard object based media as the next great revolution in media production and consumption. Others are more sceptical. All offers of media interactivity to date have had only modest uptake from consumers; producers themselves are rarely motivated by interactivity; and rights deals alone could heavily constrain the possibilities for customisation.

Having said this, consumers are becoming increasingly demanding of audio, and a huge proportion have some kind of accessibility need – particular if one includes those who aren't watching in their native language. The accessibility requirements of online media may prove a 'sleeper' consumer demand which will explode in a few years time; and object based media may come to be seen as the way to meet that demand.

The notion of separating media into components is not new: subtitles have been available as a separate component for years; feature films are already sometimes maintained in their component parts until they can be combined at the last moment as a particular version for a particular market; and the DPP is working with other organisations to develop a Mastering Format to enable componentised versioning for broadcast content.

But object based media in its ultimate form, where consumers can freely customise how they experience their content from their living room, is still some way off.

BENEFITS SUMMARY

🕒 Timing	LATER & ONE DAY	💡 Creative benefits	MEDIUM
★ Financial benefits	LOW	£ Investment costs	HIGH
⚙️ Operational benefits	MEDIUM	OVERALL BUSINESS BENEFIT	LOW

MANAGING PRODUCTIONS ON LOCATION

If there is an equivalent in the non-live production world to a major outside broadcast, it would be high end location based drama. This is the production environment that really tests the transport and management of audio-visual content.

And to date the impact of IP is limited. The challenge is the sheer size of files. Productions shoot in 4K to 8K resolutions. A major movie will require around 1.5 petabytes of storage. Even a TV drama is likely to need around 400 terabytes.

The sheer size and number of the rushes files is such that the content needs to be handled on location. On a major drama shoot this is likely to involve the installation on location of LTO digital tape storage, or RAIDed solid state disks. In effect, a post production facility is created adjacent to the set.

Rushes are processed each day, and turned into viewing copies that can be shared over the Internet for executive review. It is this process of sharing viewing copies that makes the greatest use of connectivity. But connectivity from location is often very poor: available upload speeds of around 8Mbps are quite normal. And while this is adequate for viewing copies, it is impossible to consider uploading high resolution files directly to the cloud.

High speed connectivity is still integral to the production process – but only after high resolution content has been physically moved from the location storage to offsite storage. Once that content is under the management of a specialist provider, with its own high speed links, then it is distributed widely over IP networks.

“ The use of connectivity in the production process is saving money and time – and is allowing work to be spread across the world. Each production has its own range of specialisms, and the time frames for accessing these is coming down because of connectivity. Being able to use the best and most appropriate suppliers is a real creative benefit. The next evolution, as bandwidth increases, will be for everything to be in the cloud – one place where everyone works, with finished content only pulled down at the end of the process. But this is at least five years away.

WEYRON HENRIQUES
DIRECTOR OF SOFTWARE DEVELOPMENT, EFILM/DELUXE

There is no doubt that cloud based rushes management is the long term goal. A single repository for content, from which the increasingly broad range of international specialists involved in a film project can draw, would bring both operational and creative benefits. Visual effects, for example, now often involves a number of providers, distributed around the world. The management and distribution of high numbers of different versions of finished material would also be more effectively achieved from the cloud.

Whether or not this new way of working would also bring financial benefits is too difficult to predict at this stage. Certainly the cost models for connectivity would need to become better adapted to the media sector.

“ We had a major project shooting at a location across the city. We wanted to lease a connection between our facility and the location. Incredibly, it proved cheaper to lease dark fibre than to procure 10Gb IP bandwidth. The dark fibre option was expensive but the same each year. But the leased line required a huge upfront fee and then a lower annual lease. The trouble is the production could only guarantee work for 12 months. But in the telco world they still want a three, five or seven year deal.

PAUL CLENNELL
CTO, DOCK10

BENEFITS SUMMARY

🕒 Timing	ONE DAY	💡 Creative benefits	MEDIUM
★ Financial benefits	LOW	£ Investment costs	HIGH
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	LOW

POST PRODUCTION

The terms 'off-line' and 'on-line' have been outmoded for many years – a strange heritage language from the days of linear editing. But in the world of cloud based editing they become completely redundant.

'Finishing' is now a well understood term to replace 'on-line', and is the moment when content is put together in its highest quality ready for distribution. It usually requires a professionalised environment, with high quality sound and picture monitoring. The appropriate term for all the processes prior to finishing is now rather less clear – especially as connected working means most of them happen online.

But however we term all the activities prior to finishing, it is these processes that can benefit most from IP. It is now possible to locate both rushes material and the software required to work on those rushes in the cloud. The chosen edit platform does not need to sit on the machine that is performing the edit; and neither do the rushes. This is often referred to as 'virtualised' or cloud editing.

Much like with IP based outside broadcasts, there are great benefits of flexibility and scale in virtualised editing. Rushes storage can be scaled up and down, and the customer only needs to pay for what they use. The number of edit seats can also be increased or reduced, at a moment's notice.

“ Investing in connectivity rather than buildings now makes a lot of sense. The future will be virtual editing – using editors we know, but letting them work from home, or renting an office for a particular production. In a few years time we will only use our own building for finishing. This gives me scalability, reduces overheads, and makes it easier to grow and to accommodate the peakiness of contracts. Suddenly you have more options. It's a nice half way point between production having its own post and going into a facility. It also means we can tighten up workflows, have fewer camera cards flying around, and maintain better security.

SIMON GREEN
FOUNDER AND CEO, GREEN ROCK

Far from spelling the end of the post production facility, this new way of working maintains the pivotal role of the post producer as the trusted broker between production and the technology services they require to deliver.

“ Everyone we work with is on an Internet connection – but they don't have direct connectivity into the cloud. This is where we can help them. We can help with international file transfer, transcoding, storage, and remote editing. If you have a good Internet connection you now really can work at full HD at home on your laptop. You are watching the full resolution source file – in pixel-perfect playback – sent to you as a virtual desktop. It still requires a fibre connection – so customers are increasingly asking us to broker their connectivity provision also.

BEN FOAKES
MANAGING DIRECTOR, BASE MEDIA CLOUD

Connectivity, as always, remains the constraining factor. But the principle of supplying every aspect of production as a service makes a lot of sense in an industry that operates in a project based model.

“Being able to work pay-as-you-go is the big thing: not having to commit makes a huge difference, both to the supplier and customer. Traditionally the industry has been pay-as-you-go, and this is increased by connected working: it extends a model that is natural to the industry.

PAUL WILKES
HEAD OF PICTURE POST PRODUCTION, PINEWOOD STUDIOS GROUP

Views on the cost benefit of working this way vary. Our research suggests a production could save as much as 30-40% across a series by only paying for what is needed – rather than provisioning services to a peak. The day-by-day rates may not be different: the saving will come from better scheduling of resources.

“Are edit costs falling for productions? Not really. But it becomes more about what can you achieve in an edit in a day: less about cost, more about value. Getting more done in the day; and sometimes therefore needing fewer days. It is also about greater access to a greater range of assets – such as what an editor can achieve without leaving the suite, by utilising services like the Adobe Creative Cloud and third party apps.”

SIMON GREEN
FOUNDER AND CEO, GREEN ROCK

“The investment means there is actually a risk of additional cost. There is also still people’s time, high end environments for finishing, overheads, training, security management to pay for. Overall the cost to the customer probably remains similar: I struggle to think of a cost that has been stripped away to everyone’s benefit. In some respects connectivity has brought more formal, organised ways of working however. And a new company that could plan to work with IP from scratch could probably do it more cheaply.

PAUL WILKES
HEAD OF PICTURE POST PRODUCTION, PINEWOOD STUDIOS GROUP

BENEFITS SUMMARY

🕒 Timing	NOW & NEXT	💡 Creative benefits	MEDIUM
★ Financial benefits	MEDIUM	£ Investment costs	MEDIUM
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	MEDIUM

MEDIA MANAGEMENT

A huge part of the media industry is largely invisible to both the producer and the consumer. This is the movement, storage and management of media undertaken behind the scenes by large scale operations such as broadcasters, distributors, delivery networks and rights holders.

Some of these businesses are now beginning to invest in IP based facilities, media asset management and infrastructure. Those investment costs will be very considerable – depending in part on where the organisation is in its refresh cycles for existing infrastructure. Technically it is now possible to establish an IP based media facility; the bandwidth needs make it costly; but an organisation will be set up for the future.

“ We are in the process of upgrading our facilities to IP. A lot of the benefits Sky sees are from the wider group – that is, the IP connectivity between the three European companies. The business case was based on scaling up and SDI just didn't stack up. IP kit is so flexible. You might need processing power one day and something else the next, and you don't have to keep buying specialist kit for each need. The capital expenditure has become a fraction of the cost. There is still a long way to go, but big projects such as this can be an opportunity to be at the cutting edge of technology.

MARTIN RICHARDS
SENIOR DESIGN ENGINEER, SKY

Within a few years IP infrastructure may be essential to doing business, and that's because of the nature of the potential benefits. The first of those benefits, as always, is scaling and flexibility. There is also likely to be a requirement for a lower number of support staff. Connectivity costs between companies or locations within the group will be lower, as they will be with other companies who are able to interconnect within the cloud ecosystem.

But perhaps most compelling of all soon will be the opportunities for automation, machine learning, and analytics that will come from a fully connected operation. This could quickly become – and arguably already is becoming – a key differentiator between businesses.

“ People want to automate, and have access from any platform, anywhere in the world. It's a natural progression from the consumer experience of slick apps and smooth updates at home, to expect the same thing from broadcast systems at work. Many media companies are struggling with all their different point solutions and want to bring them together into one interface, which helps to reduce the Total Cost of Operations (TCOP).

Collaboration is one of the big opportunities that comes from putting content in the middle. Having real time access to content not just within the enterprise, but across the supply chain too really simplifies things

and offers 'one moment of truth'. It's all about creative enablement: less time worrying about the logistics and systems means more time to spend on the creative output. Broadcasters can spend more of their money on content, while relying on the efficiency and lower TCOP of using third parties to run their systems.

RYAN LEIGH
VP EMEA, PRIME FOCUS TECHNOLOGIES

BENEFITS SUMMARY

🕒 Timing	NOW & NEXT	💡 Creative benefits	HIGH
★ Financial benefits	MEDIUM	£ Investment costs	HIGH
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	HIGH

CLOUD PLAYOUT

Cloud based channel playout has been discussed for many years. It is already happening for some small channels with a fixed schedule. The real test of cloud playout however would be its ability to support a major network – one that requires a truly ‘broadcast’ level of resilience, has live continuity announcements, and may change its schedule at a moment’s notice if there is a major national event.

“ Master control and distribution in the cloud means running a TV station fully in the cloud: having sixty different ad breaks for sixty different territories, and then going back to live programming again. It is so dependent on the video signal and the timing issues that brings. But maybe in three years time it will be possible? Once we get control and playout from the public cloud, we’ll start to get further production advances.

MICHAEL HARABIN

VP TECHNOLOGY, ENGINEERING AND MEDIA MANAGEMENT, PAG-12

When this capability comes, the savings could be as high as 50%, from efficiencies in cloud and software workflows, and from broadcasters no longer having to own so much infrastructure and real estate. Resilience should actually be greater, and also cheaper, since there will be no need to maintain physical disaster recovery sites. In an IP world, additional global availability zones and pre-running services can be switched to in a matter of milliseconds on the identification of a failure. There will also be creative and competitive benefits from being able to pop up and pop down channels at short notice – as short as a few days, rather than the six months currently required.

Although the test of this application of IP is its use by major broadcasters, micro-broadcasters and rights-owning bodies wishing to establish themselves as broadcasters will also be beneficiaries. So the arrival of Cloud Playout could add to the disruption that already exists in the media industry.

“ IP cameras and mixers are revolutionising the ability to deliver content into the cloud – and it’s helped to grow online and TV playout of niche services. There are huge efficiencies – significantly cheaper than a traditional vendor – from being able to use very granular services you can wire together as needed via cloud and IP workflows. If you’ve done it properly in IP and not just replicated SDI, that’s where the savings come in. You can build infrastructure or workflow as code – it’s all in the software. And if you don’t need something any more you can just turn it off.

PAUL MARDLING

VP OF STRATEGY, PIKSEL

BENEFITS SUMMARY

🕒 Timing	NEXT	💡 Creative benefits	HIGH
★ Financial benefits	HIGH	💷 Investment costs	MEDIUM
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	HIGH

IP DISTRIBUTION

As discussed earlier, the focus in this report is upon the business benefits of IP in the production process rather than in audience consumption.

However an increasing number of production operations are now premised upon the supply of content direct to online. This supply to online platforms – whether owned by the producer itself or a third party – is the cheapest and most flexible version of ‘cloud playout’, and it is already here.

As with cloud playout, IP distribution allows for services to be scaled up and down very quickly. When the platforms are owned by Internet giants, the producer gets the benefit of global scale and resilience at very little cost. Smaller content creating entities get access to global markets, and the costs of delivery are low when the volumes are low. This cost equation changes however where the producer or distributor owns its own platform, the volumes become high, and supply to a wide range of devices becomes critical.

What’s interesting about the business benefits in this category however is that they are binary: without connected supply and distribution, there is no business; but the existence of online video has created a huge media market that didn’t exist before.

“ Live streaming online can be very cost effective but it scales in a very different way from over-the-air transmission. While the upfront investment is lower, for every viewer there is an incremental cost. It is a very different way of broadcasting. And while distribution on a platform like Facebook won’t carry the same costs, you won’t have ownership of the viewer experience. Online streaming does pose risks for incumbent broadcasters: they may only be able to recoup costs from the local markets in which they broadcast, while major OTT distributors have truly global audiences. Meanwhile smaller content producers get a huge upside from access to global audiences if they work with those major OTT distributors.

ROWAN DE POMERAI
HEAD OF FLEX DELIVERY, OOOYALA

More and more owner-publishers will want to be able to distribute at scale, and they will want to do so on their own platforms so that they can control the viewing experience and the data flows. But they will want to do this without incurring ever increasing distribution costs. What will be interesting to see in the next few years is the way in which the IT industry responds to this market – and to the reality that video is now powering the Internet – by developing ever more sophisticated, better value, fast and resilient networks for delivery.

In time everyone from a small production company to a major broadcaster may start to benefit from this capability. In short it will mark the move to IP broadcasting. The brake will come from the provision of consumer connectivity. National broadcasters with commitments to universality will be hindered by the consumer connectivity constraint. The new content distributors will not.

So in many respects the greatest business benefit of IP is a truism: the production of content for distribution over IP benefits all those producers and rights holders who make distribution over IP their business.

BENEFITS SUMMARY

🕒 Timing	NOW	💡 Creative benefits	HIGH
★ Financial benefits	HIGH	£ Investment costs	LOW
⚙️ Operational benefits	HIGH	OVERALL BUSINESS BENEFIT	HIGH

Conclusion

There are fundamental characteristics of an IP based workflow that make it intrinsically beneficial: it provides scalability and flexibility, and is supportive of cloud based and service based operating models.

“ Slowly – very slowly – we are moving towards video flowing from the lens of the camera to the audience wholly through IP. The economics of convergence and commodisation and the ways we move data around the world using Internet protocol mean you would have to have a really good reason not to put IP in when doing a refresh.

ROWAN DE POMERAI
HEAD OF FLEX DELIVERY, OOYALA

In this sense there are always business benefits to a move to IP, in any production context.

But which production activities will deliver the greatest return soonest if moved to an IP based model?

Business Benefits: a prioritised view

In order to gain a prioritised view, scores have been attached to the subjective ratings applied in the survey above. The scorings are as follows:

	NOW	NEXT	LATER	ONE DAY
🕒 Timing	4	3	2	1
★ Financial benefits		HIGH 3	MEDIUM 2	LOW 1
⚙️ Operational benefits		HIGH 3	MEDIUM 2	LOW 1
💡 Creative benefits		HIGH 3	MEDIUM 2	LOW 1
£ Investment costs		LOW 3	MEDIUM 2	HIGH 1

It feels appropriate that the lowest available score is 5 (rather than 0), since this is reflective of the fact that the move to IP has inherent benefits. And of course as the overall media ecosystem shifts to IP, the benefit for any activity of making the shift will be greater, and the cost will most probably become lower.

It will be noted that in the timing element of the ratings applied in the survey, we sometimes say 'now and next', or even 'later and one day.' Where we rated 'now and next' we have scored it as next (3), since any current implementations are clearly embryonic and will have some of the issues of early adoption. Where we have rated an activity as 'Later and One Day' we have scored it as One Day (1), since any development that is currently around five years away will not present well in a business case.

On the basis of this approach the following picture emerges:

PRODUCTION ACTIVITY	HIGHEST OVERALL BUSINESS BENEFIT
16 = highest possible score; 5 = lowest possible score	
IP Distribution	16
Live Streaming	16
Single Camera Shooting	16
Media Management	14
Cloud Playout	14
Post production	13
Events Coverage	11
Multi Camera Shooting	11
Managing Productions on Location	8
Object Based Production	7



The business benefits of IP production: three key conclusions

1 OTT trumps broadcasting

Online content is revolutionising the media industry, so perhaps it is no surprise to find the production activities that supply to that market are the ones that offer greatest business benefits. Indeed, as we observed in the report, new businesses are being created by the opportunities offered by online.

IP purists might complain that this is not what we really mean by 'IP production'. But that's technology semantics: the fact is that the three production activities that score very highly on business benefit all exhibit those core IP characteristics of scalability, flexibility and service based working. As any business change expert will report, it is the changes to business practices brought by technology that matter – not the technology itself.

2 Heavy lifting requires heavy investment

Large scale outside broadcasts are in many respects the ultimate form of media generation. The combination of scale, profile, technical complexity and live coverage makes this production activity a visceral challenge. The rewards can be huge – but so can the costs.

Major events coverage involves building, in effect, a temporary broadcast centre. Is it any wonder therefore that the move to IP for this type of production is complex and expensive? The scale of the endeavour is so uniquely huge that it doesn't really matter to the industry in general that it may take a while. But once complete it may find itself operating in a very different landscape. On the one hand there will be growing competition from small OBs and live streaming productions that adopt compressed IP infrastructure to reduce costs and increase flexibility in a way that traditional broadcast operations can't compete with. While on the other, when it comes to enabling major events over IP, broadcasters may find themselves paying for an infrastructure change that will ultimately benefit their rivals: what's stopping the global online providers from moving into major events coverage?

3 The greatest disruption sits in the second tier

Production activities that directly deliver to OTT platforms already often make beneficial business propositions. But if one is looking to steal early mover advantage it is the next group of activities that require attention: media management, cloud playout and post production. A company Board would do well to pay attention to any well-written business case relating to these areas.

Media management, cloud playout and post production are where technology change could facilitate major changes in operating models. And just as the removal of videotape unleashed many other benefits by enabling fully digital working, so the creation of fully IP working in these areas will finally give meaning and purpose to those other innovations that up until now have just been words: machine learning, analytics and AI.

One overarching truth from this survey is that there are already sufficient benefits to be derived from working with IP for most media businesses to be sure they will find themselves looking at new business cases in the months ahead. The success or otherwise of those cases may depend on more than just the benefits described here. The cases may also be a test of how well the company's business processes can adapt to the service led business models invited by IP.

The business change associated with technology innovation in media is usually assumed to be located in the production community. But with IP production there's just as much business change for the finance and operations community. If the Finance Director gives you a withering look when you present your IP business case, it may be for no other reason than fear of the transformation it requires of them.

This DPP survey report was researched by **Mark Harrison, Andy Wilson** and **Lisa Kelso**, and authored by **Mark Harrison**. Design was by **Vlad Cohen**. The DPP would like to thank **Chris Esposito**, who contributed to chapter 3, and to the very many people, from a huge range of companies, who have contributed their insight and expertise across the report.

About the DPP

The DPP is the media industry's business change network. Originally founded by UK Broadcasters the BBC, ITV and Channel 4, it is now a not-for-profit company with an international membership base drawn from the whole media supply chain – broadcasters and distributors to manufacturers and service providers, production to post production, trade bodies to educational institutions. The DPP harnesses the collective intelligence of that membership to generate insight, enable change and create market opportunity. For more information, or to enquire about membership, visit www.digitalproductionpartnership.co.uk.

About Ooyala

A US based subsidiary of global telecommunications and IT services company Telstra, Ooyala's comprehensive suite of offerings includes one of the world's largest premium video platforms, a leading ad serving and programmatic platform and media logistics solution that improves video production workflows. Built with superior analytics capabilities for advanced business intelligence, Ooyala's solutions help broadcasters, operators and media companies build more engaged and more profitable audiences, with personalized experiences across every screen. Vudu, NBCUniversal, Star India, Sky Sports (U.K.), ITV Studios (U.K.), RTL Group (Germany), M6 (France), TV4 (Sweden), Mediaset (Spain), America Television (Peru), and Media Prima (Malaysia): these are just a few of the hundreds of broadcasters and media companies who choose Ooyala. Headquartered in Silicon Valley, Ooyala has offices in Chennai, Cologne, Dallas, Guadalajara, London, Madrid, New York, Paris, Singapore, Stockholm, Sydney, Tokyo, and sales operations in many other countries across the globe. For more information, visit www.ooyala.com.

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