



ESA Space Weather study

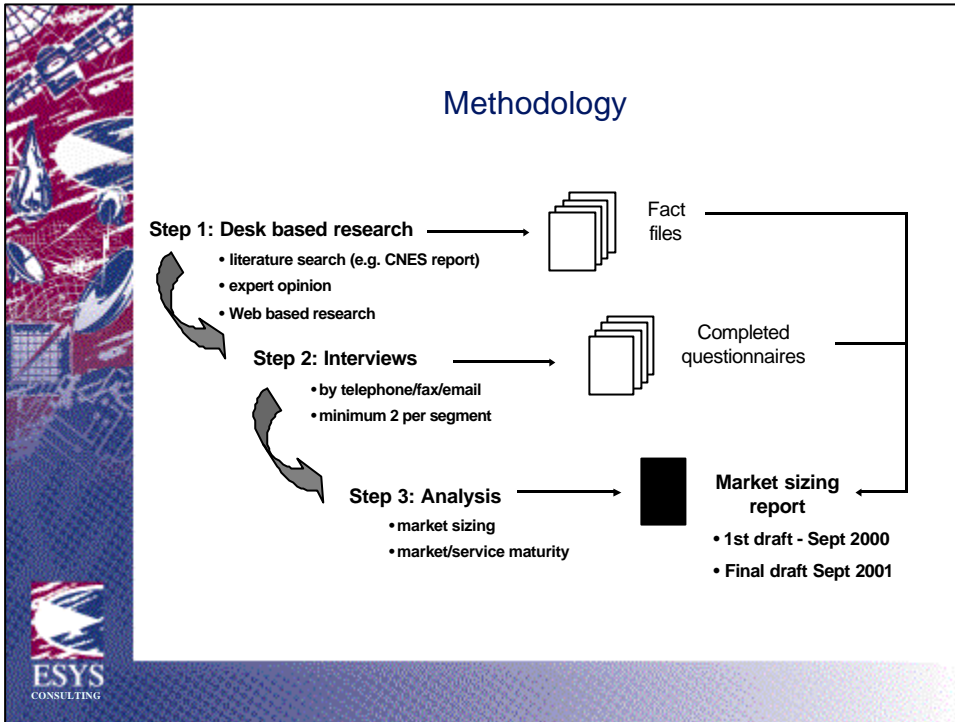
Market analysis Final report highlights

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Objectives of market analysis

- Assess the commercial benefits of a European Space Weather programme
- Identify market segments, user requirements and drivers for uptake of SW services
- What opportunities and support exists for a European SW programme?



Market segmentation

Segment category	Sub group	SW impacts/effects	SW Products/service
Satellite infrastructure	Satellite operators Satellite manufacturers Launch operators	Spacecraft charging Deep dielectric charging Anomalies Gradual degradation Electronic and sensor upsets Sensor interference Altitude decrease due to increased atmospheric drag Problems with attitude control systems	Forecasts/warnings/nowcasts Post-event analysis
Ground infrastructure	Power generators and distributors Pipeline operators Railway companies Cable companies	GIC/GIP Pipeline erosion Rail switching problems	GIC monitoring services
Human	Airline crew Frequent travellers Man in space Space tourists	Health problems/issues	Exposure levels
Communications and navigation	GPS users HF communications Terrestrial mobile network operators	Loss or degradation of service due to ionospheric influences	Forecast/warning/nowcast
Insurance	Primary insurers Reinsurers	Claims related to/caused by SW events	Information, science, understanding
Related industries	Oil and gas prospectors Tourism agencies Agriculture Climate modelling	Various	Various TBD


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Drivers for SW services

Loss estimates highly uncertain, poor primary data


- Economic impacts

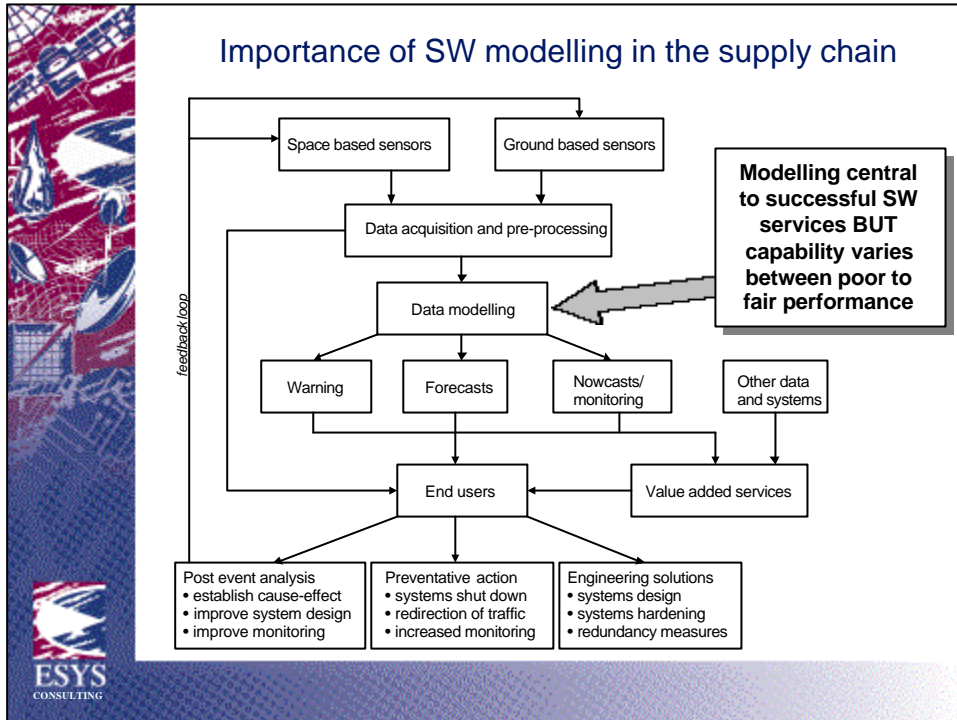
Sector	Magnitude of individual events	Annualised loss estimate
Satellite operations	Total loss: €100-200M Service outage: €100K	€70-100M
Power distribution	Catastrophic event: €6B Transformer loss: €1-2M	€100M
Communication	Service outage: €100K	€10M
Total		€180-210M
- European share of losses estimated at 30-40% by GDP equivalent to €5-85M per annum
- Social impacts
 - human effects on aircrew and astronauts
 - satellite navigation services
 - >250 million users of GPS
 - European Galileo system will improve global sat-nav services
 - indirect impacts of satellite and power network failure



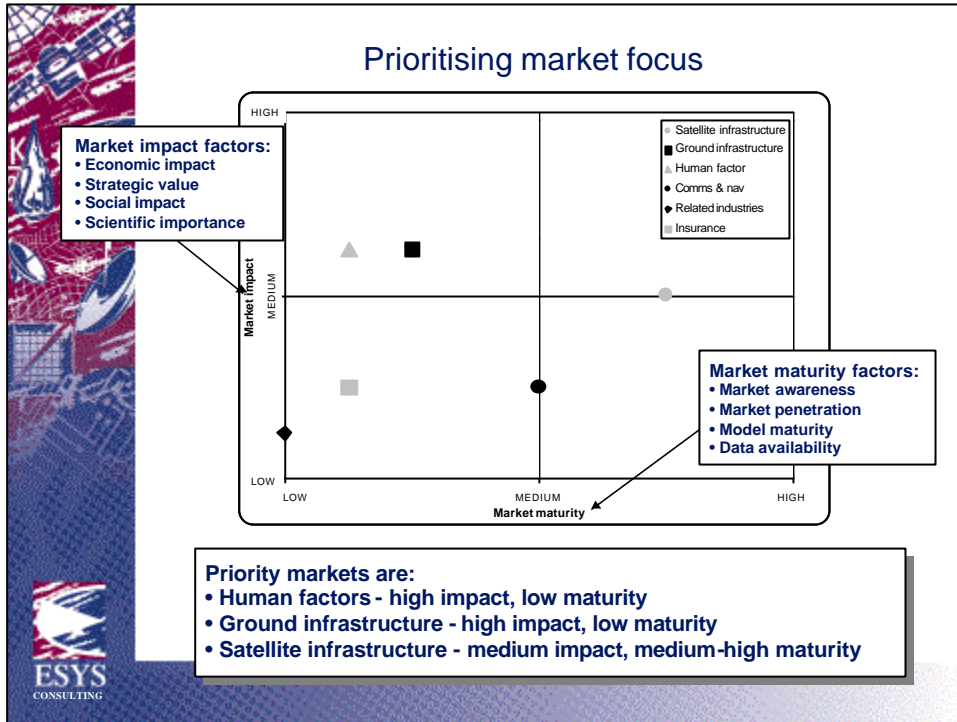
Markets for SW services

- Public information services (generally free to users)
 - NOAA SEC most widely quoted service
 - high profile
 - 2.3 million website hits during recent solar storm
 - ISES network
 - lower profile
 - special interest groups
- Contract R&D
 - specialist SW centres (e.g. CLS, RAL, MSSSL, Lund, etc)
 - services to satellite, power, airline, oil/gas, and insurance companies
 - estimated to be worth 4-5M per annum
- Commercial value added services
 - Metatech only major example (in conjunction with Sunburst network)
 - currently ~ 1-2M p.a., future potential ~ 10M p.a.
 - some business in tourism
- Better forecasting and data sources could lead to more examples
 - especially in satellite operations





- ### Support for an ESA SW programme
- ❑ 88% of interviewees supported, in principle, an ESA Space Weather programme
 - ❑ 69% of interviewees expressed an interest in providing representation within some kind of user forum
 - ❑ Attitudes towards the type of service provision were ambiguous
 - 38% indicated some form of public service entity was required
 - the same number recommended a role for industry within the service
 - ❑ The main drivers for a European SW programme include:
 - access to new and independent data sources
 - improved SW modelling and forecasting
 - increased user involvement
 - ❑ Some respondents pointed out the need to co-operate with the US
- Science requirements provide the greatest impetus for a SW programme. Commercial interests exist but users still need reassurance through involvement of appropriate public bodies.**
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- ### Conclusions
- ❑ Economic losses as a result of SW are estimated to run into many tens of millions of Euro per annum
 - Further effort is necessary to fully understand the economic and social risks involved
 - ❑ Commercial opportunities are currently limited but will improve with:
 - Availability of more and better data
 - Development of better SW forecast models
 - ❑ Europe should proceed with a SW programme that:
 - Provides independent data acquisition and monitoring capability, possibly within the auspices of a European public service entity ;
 - Maximises European collaboration as well as co-ordination with US counterparts;
 - Provides a forum for user representation to drive requirements and service evolution;
 - Focuses on the priority markets of ground infrastructure, human factors and satellite infrastructure.
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Recommendations

- ❑ A formal Cost-Benefit Analysis should be carried out to determine the wider social and scientific drivers for a European SW Programme
 - The estimated costs of a SW programme should be measured against the potential additional benefits to be derived over and above that which is already available from other sources.
 - A cost-benefit analysis is necessary given the proportion of benefits that are social and scientific in nature and not a direct economic impact.
- ❑ A long term plan for user representation should be defined that provides an open forum for expression of information and service requirements.
 - ESA should capitalise upon the clear interest and commitment of users to be part of the drive towards a European SW Programme