



Market Analysis of SPENVIS

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1 INTRODUCTION

RHEA System is responsible for the analysis of the SPENVIS user database, business model development and implementation. This market analysis provides an analysis of the profiles and requirements of SPENVIS users under WP1210. In addition, to the above objective the market analysis will provide recommendations on SPENVIS commercialisation strategy. These recommendations will support the development of a future business model in WP1220. The proposed business model will aim at providing a solution under which SPENVIS can be commercialised through a cost-effective approach.

SPENVIS is an internet based interface that includes extensive information on the space environment and models [1]. Scientists and engineers can use it for the generation of spacecraft orbits, perform mission analysis and planning and make space environment predictions.

2 METHODOLOGY

The research objectives of this market analysis are to describe the SPENVIS users profiles, usage modes and requirements. In order to achieve these objectives, market questionnaires were sent directly to all the SPENVIS users. This approach of market data gathering was cost-effective and respondents were not biased when answering the questions.

Figure 1 presents an overview of the process used for achieving the research objectives. The first step was to define the variables and request the respondents to answer the questions. Followed by data consolidation (e.g. demographics, operating, interface, positioning variables) and analysis for SPENVIS users profiles and requirements.

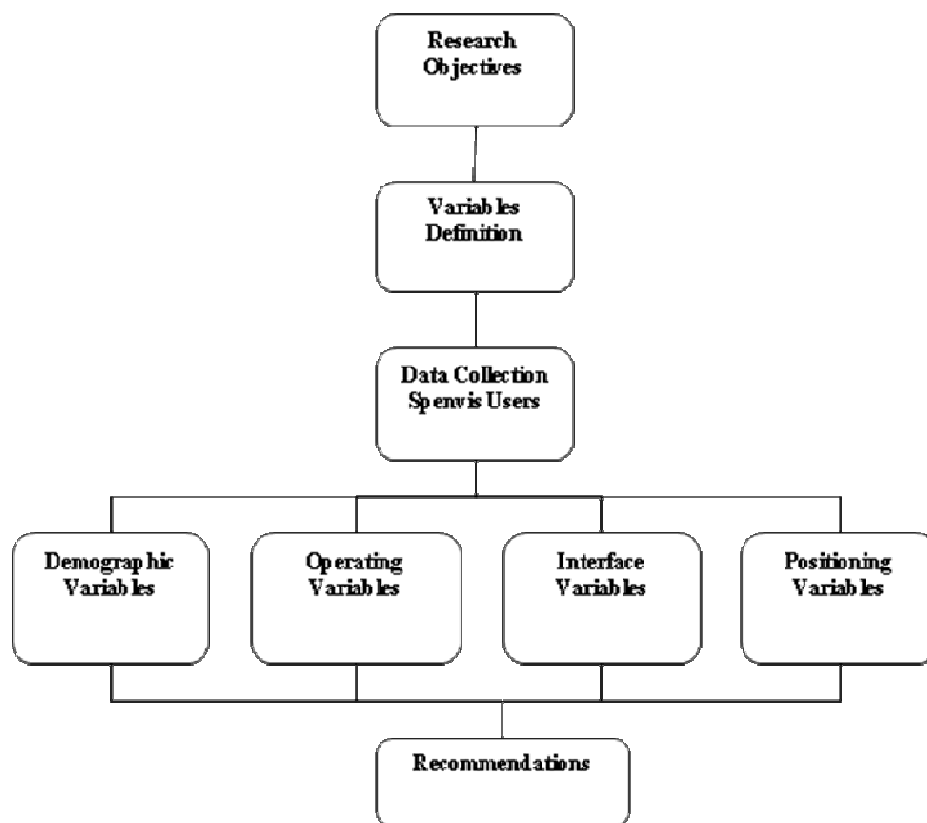


Figure 1 Methodology for Market Analysis

3 GENERAL PROFILE OF SPENVIS TOTAL USERS

SPENVIS has 4021 users world-wide and of which 3204 are active ones¹. The users are divided into normal and advanced ones. The advanced ones have additional options and parameters for running space environment models.

The SPENVIS users are classified by BIRA by geographic location: ESA member states, former Eastern Europe, United States and the other (i.e. Japan, Canada, etc.).

In order to have a understanding of the SPENVIS Users General Profile, there is an overview of the types of SPENVIS users in Figure 2.

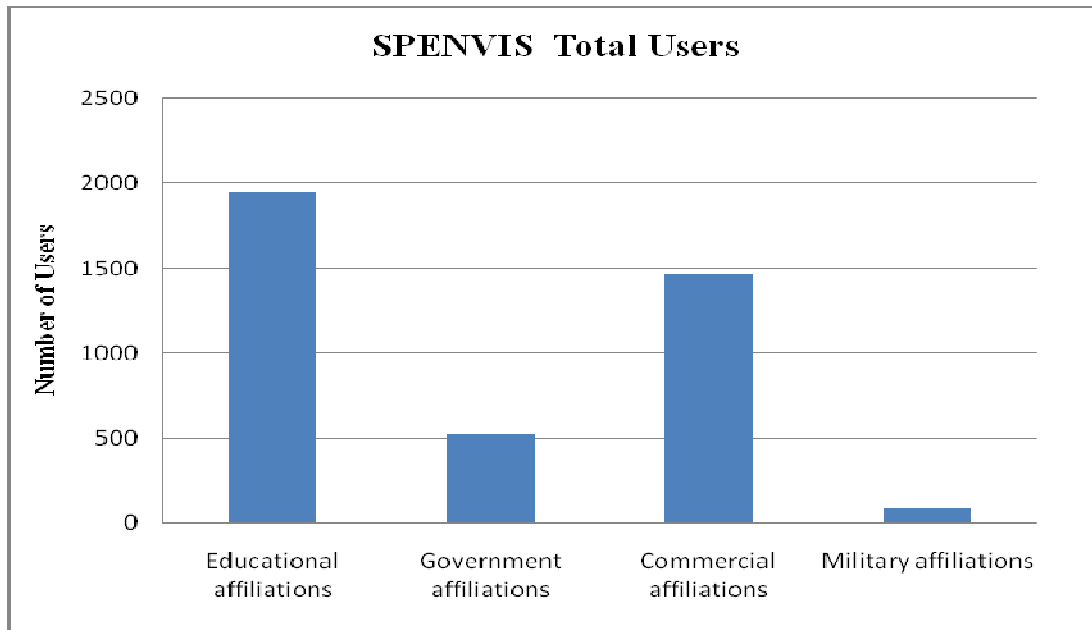


Figure 2 SPENVIS total users

The main users of SPENVIS are universities and research centres and they represent around 49% of the users, followed by the commercial ones which represent around 37%. The difference between the educational and commercial users is not so big and BIRA can apply a differentiated commercialisation strategy depending on the users profiles and their geographical location as presented in Figure 3.

¹ The active users are ones that have an active account. For 2006 the total number of active users correspond to 1172, there is a trend of increase of Spenvis users since the beginning of the year. For the first six months of 2007 the users accessing SPENVIS correspond to 826.

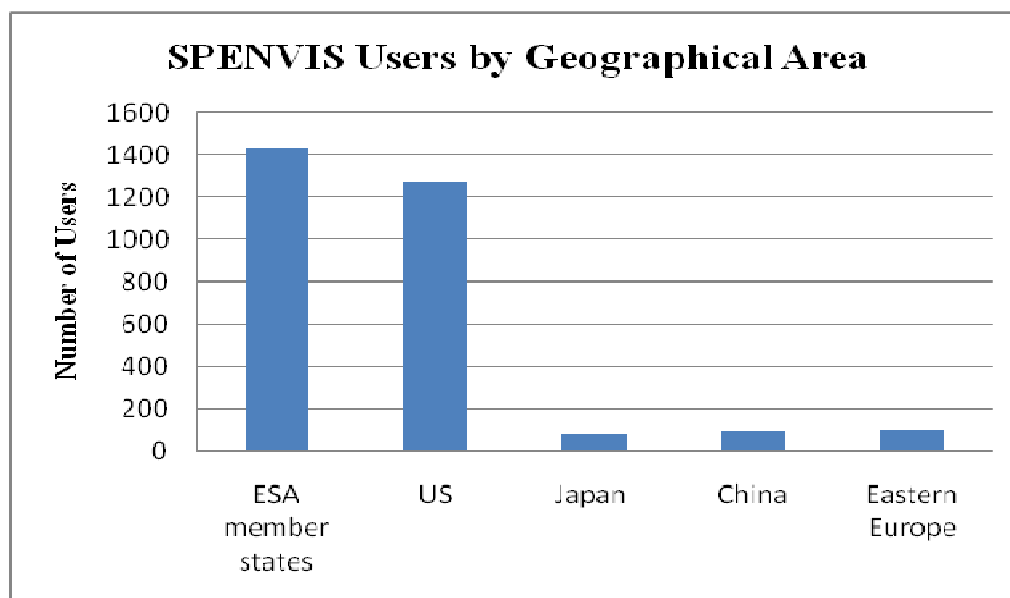


Figure 3 SPENVIS Users by Geographical Area

SPENVIS users are primarily based in ESA member states (36%) and the US (32%), followed by China, Japan and Eastern European countries. So the targeted users for SPENVIS commercialisation should come from ESA Member countries and the US.

The geographical distribution of the overall SPENVIS users in combination with the organisations profile, provides a clear understanding of the type of users to be targeted worldwide.

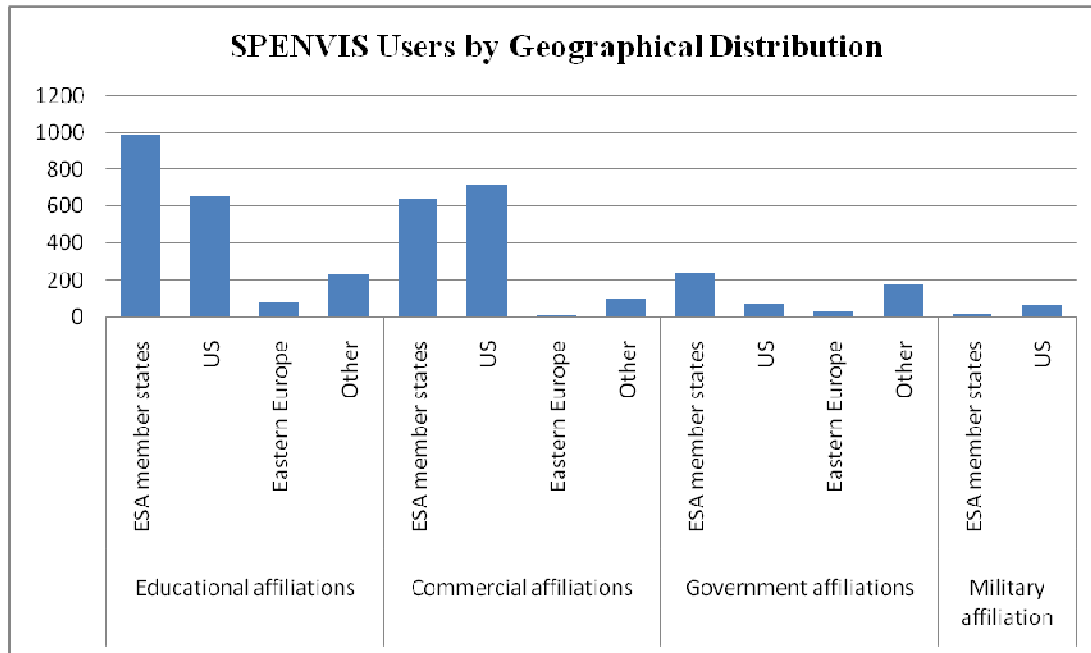


Figure 4 SPENVIS Users by Affiliation and Geographical Distribution

Figure 4 shows that the main SPENVIS users from the educational affiliations are from ESA member states and the main commercial ones from both the US and ESA member states. The difference between the commercial users in the US (49%) and ESA (44%) member states, isn't so big and therefore, if BIRA can target both US and European commercial users for commercial distribution of SPENVIS services.

4 MARKET DATA ANALYSIS

In order to be able to analyse existing users' profile and reasons for selecting SPENVIS by the users, it is important to understand SPENVIS market positioning. Rhea prepared a market questionnaire (see Annex 1) and it was reviewed by BIRA and sent to SPENVIS users. For the period from May to June, BIRA received around 48 filled questionnaires covering demographic, operating, interface and positioning variables.

4.1 SPENVIS Users Demographic profiles

The demographic variables, provide information on the size, type and geographical positioning of the organisations.

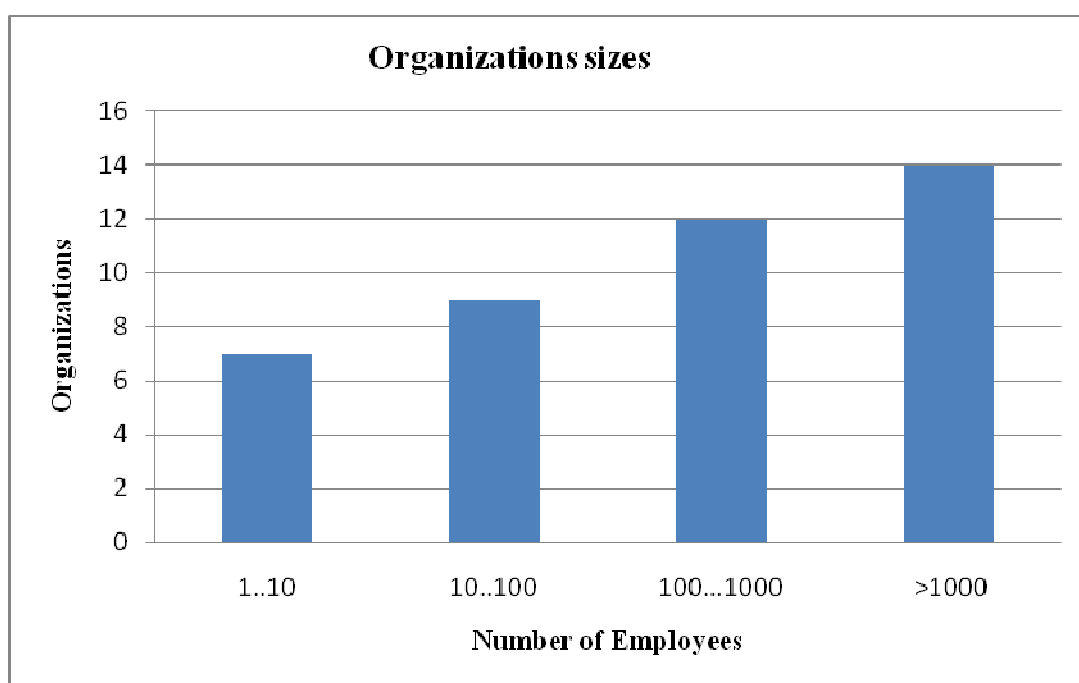


Figure 5 Size of organisations using SPENVIS

Figure 5, shows that around 62% of the prime SPENVIS respondents are from organisations with employees of 100.....1000 and > 1000. This is not surprising as the main users of SPENVIS are primarily education and commercial organisations, as presented in section 3. Furthermore, BIRA can offer to its users differentiated bundle of services for organisations of 100...1000 and ones bigger than > 1000 ones.

The overall SPENVIS users (see section 3) are primarily educational, government and military users and therefore, the majority of the survey respondents are from public organisations (70%), as presented in see Figure 6.

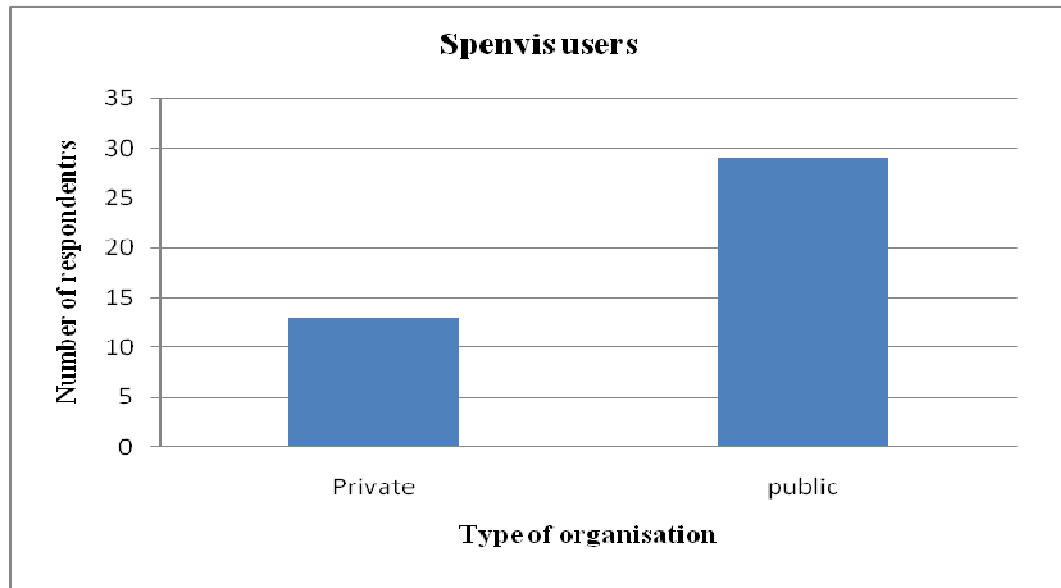


Figure 6 SPENVIS users type of organisation

BIRA can set-up agreements with these public organisations for the provision of SPENVIS solutions, that are customised for the needs of the universities, research institutes, space agencies or military organisations.

4.2 SPENVIS Applications

The better understanding of the SPENVIS applications will provide information on the definition and classification of future SPENVIS services. In the market questionnaire Question 5 requests the respondents to address the applications for which they use SPENVIS services.

- Assessment of orbital space environment
- Environmental modelling
- Simple Shield Modelling& Transport
- Anomaly Resolution
- Sanity Check against other codes
- Radiation Analyses
- Evaluation of particle fluxes
- Evaluation of radiation effects
- MULASSIS
- Geomagnetic and Solar activity indexes
- Assessment of radiation environment or Earth orbits
- Debugging SPENVIS applications
- To use references for Satellite operations and plan
- TID and SEE effects on electronics
- Radiation fulence prediction, plasma, atomic oxygen, etc.
- Orbit generator
- Trapped proton/ electron models
- Solar proton models
- Simple geometry shielding model
- Radiation
- Charging
- Satellite radiation analysis
- Mission Phases 0/A
- Upset rate calculation
- Radiation dose vs. shielding thickness calculation
- Spatial radiation in GEO
- Inputs for Geant 4 simulations of radiation environments on spacecrafts orbits
- Calculate solar cells degradation
- Analysis of orbital environments

- Valuation of electronics deliveries to space applications
- Radiation analyses on satellites
- Debris
- Space Radiation Research
- Radiation analysis for solar cell degradation calculations
- Coordinate generators
- Building satellites for communications, remote sensing and scientific experiments
- Radiation Shielding
- Radiation Protection
- Indices (Kp, DSt, etc.)
- Coordinate Systems (B, L, etc.)
- Ionosphere Models
- Spacecraft design
- Spacecraft charging
- Trapped proton and electron fluxes and solar proton fluencies
- Radiation doses (ionising and non-ionising) for simple geometries
- Sectoring analysis for dose calculation
- Damage equivalent influences for Si, GaAs and multi-junction solar cells
- Meteoroids

The SPENVIS applications are very diverse and therefore, it will be difficult to provide an overall classification of SPENVIS services for a future business model. But the knowledge of the above applications in combination with the users requirements in section 4.3 will provide an understanding of how BIRA can support future service augmentation and customisation.

4.3 SPENVIS Users Primary Requirements

The primary users requirements provide information on their actual needs. They are classified by models, storage, processing, performance and services of SPENVIS as defined by BIRA: not important, pretty important and very important.

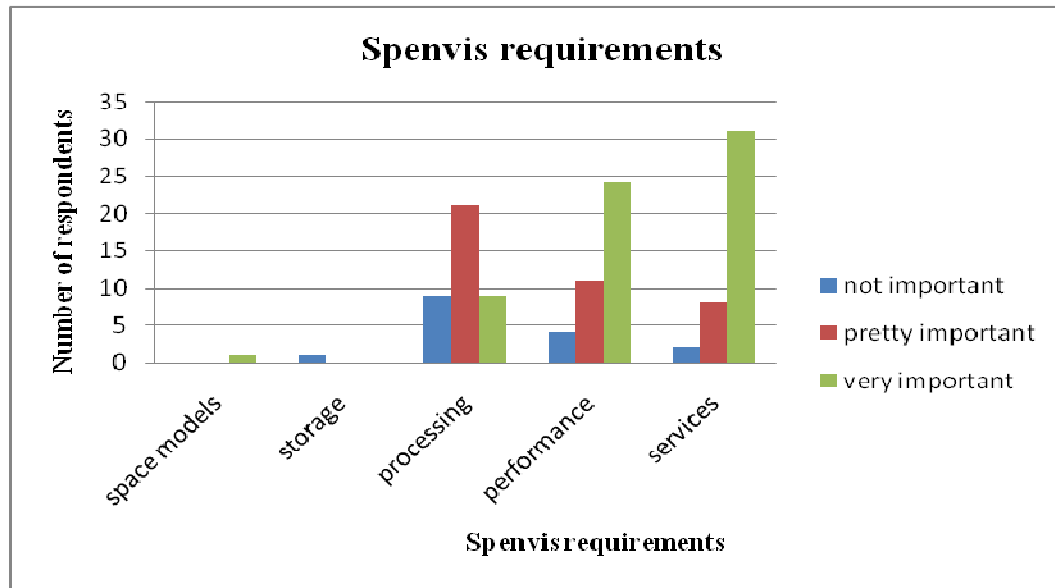


Figure 7 SPENVIS Users customers' requirements

Figure 7, shows that for 31 respondents SPENVIS services and performance are very important and for 21 respondents SPENVIS processing capabilities are most important.

In the future SPENVIS commercialisation strategy BIRA should focus on developing customer-based services in combination of high level of performance. BIRA should further investigate what are the resources and competencies, that the organisation is willing to allocate in order to define and develop customer-based services solutions.

BIRA should aim at defining a SPENVIS "service mix" that can provide internet-based services or direct customer services provision. SPENVIS future business model can offer customer services-based solutions.

BIRA can target users for which the use of SPENVIS is of critical importance for their mission success.

4.4 SPENVIS Users Interface

The SPENVIS users interface provides additional information on the users expectations on SPENVIS interfaces and services.

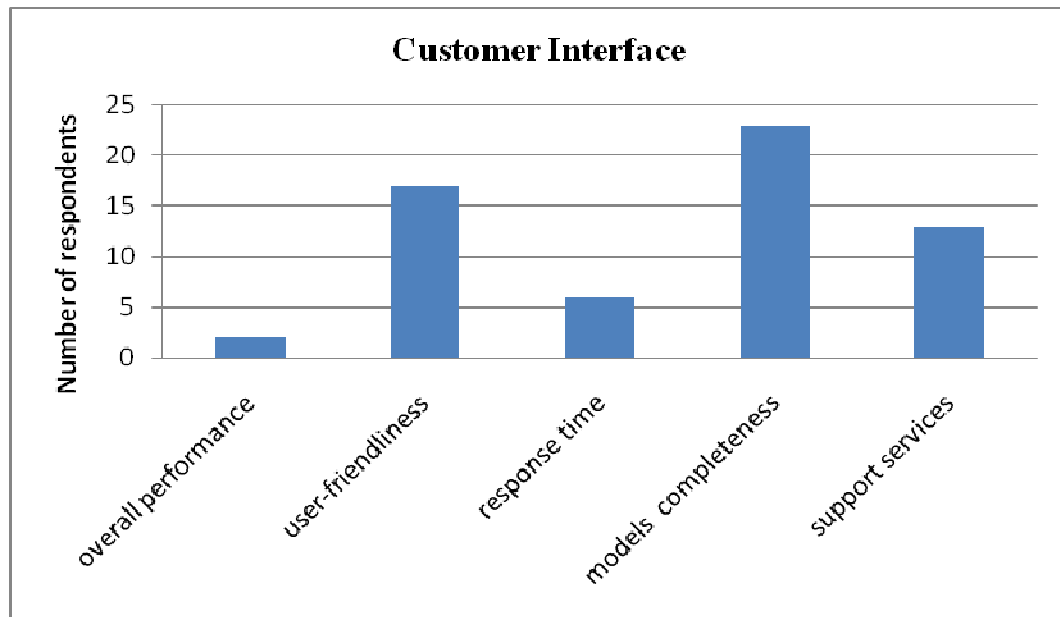


Figure 8 SPENVIS interfaces

As presented in Figure 8 for around 23 users most important is the completeness of the models, for 17 respondents the user-friendliness and for 13 respondent the support services. Model completeness, user-friendliness and support services need to be considered by BIRA for improving SPENVIS.

In addition, some users responded with “SPENVIS is great” and “all is good” others provided the following recommendations (Question 12) for improving the interfaces:

- Increased control over units, graphics and output files formats
- Longer timeframe for orbit generation and finer orbital sampling
- Include POLE for GEO electrons and other alternatives to AE8 for lower altitudes
- Easier import of spectra for shielding transport
- Output graphics resolution
- Services to be proactive
- Additional information on parameters availability
- Explanation of models and environment of satellite orbits
- Incorporate NRL-NIEL approach for solar cell radiation degradation
- Improve the server performance to shorten response time of Mulassis
- The input variables to reflected in the output files

The above variables in combination with improved graphics and services combined with an update of the help files can be considered in the future improvement of SPENVIS. The model completeness, user-friendliness and support services, need to be considered for the future SPENVIS future services definition.

4.5 SPENVIS Advantages and Solutions

The market survey requested SPENVIS users to provide information on the advantages of SPENVIS in comparison to competitors (see Question 21) and the future SPENVIS solutions (see Question 13). Both variables are analysed in this section, in order to have a better understanding of the users expectations on the solutions and the advantages users see in SPENVIS.

The users response to SPENVIS advantages of Question 21 are the following:

- SPENVIS is the best
- SPENVIS is trusted, 'up-to date', robust and fast
- The most important aspect of SPENVIS is the ease of access to the models. Each is available elsewhere stand alone, but SPENVIS provides the glue that makes it easy to use without steep learning curves
- SPENVIS team has been pro-active in keeping the models as up to date as possible
- SPENVIS is supported by competent people who respond quickly and are helpful'
- The price is right and certain elements are not available from Space Radiation
- SPENVIS provides easy access and comprehensiveness of the models for predictions
- SPENVIS is considered to have an 'outstanding performance'
- Availability of SPENVIS services
- SPENVIS design
- Very good help files providing background information
- User-friendly web-based interface and easily accessible
- SPENVIS has a complete flow of models
- SPENVIS offers good support and user meetings
- Free access
- The model and radiation effects is complete
- The quantity of different coordinates located at the same place

The above responses reveal that SPENVIS is considered to be an extremely comprehensive, user-friendly and fast tool, supported by excellent services.

BIRA can utilise the above observations not only for further development of SPENVIS services (see section 4.7) but also for the development of a market positioning strategy and 'unique selling point' for justification of charging users a price for using the tool.

BIRA can augment its SPENVIS services by further taking under consideration the solutions proposed by its users:

- Accurate, comprehensive and easy- to use an integrated turn-key system
- Output to be presented in tabular and graphical forms and the units of each axis to be adjustable on the graphical output
- Preference in a stand-alone code and licensing (i.e. Space Radiation)
- Recommendation on maintaining web-interface as a simplified services for quick tasks and further develop the stand alone version
- Specifications are quite adequate
- Incorporate CREME96 or its equivalent
- Contents to be extended
- Added functionalities to MULASSIS

From the above recommendations BIRA can continue to offer user-friendly, comprehensive and flexible tool, with improved graphics and web-site. Furthermore, BIRA can offer to its users easy access to CRÈME 96 and access to additional MULASSIS functionalities against extra payment.

4.6 SPENVIS Disadvantages

In order to improve SPENVIS services BIRA has requested to the users to describe their dislikes. Most of the users have replied that they do not have any dislikes.

Hereby, is a summary of their observations:

- Limited user control of certain environment parameters, units, spectra import, output file formats and graphics
- SPENVIS to be updated in accuracy and services
- Lack of openness
- Limited models availability
- New features development are time consuming
- Background documents are unknown (i.e. DICAT)
- Improvement of the online help pages
- Internet access may not be always available
- The response time is too long and the calculation error too large when electron shielding calculations with Mulassis are performed

BIRA can improve the online help pages and also increase access to models against payment for services. High, medium and low medium users can have access to different type of parameters, units, spectra, graphics and updated help files.

4.7 SPENVIS Subscription services

In order to have a better understanding whether SPENVIS users are willing to receive subscription services, there is an overview in Figure 9 of the respondents answers.

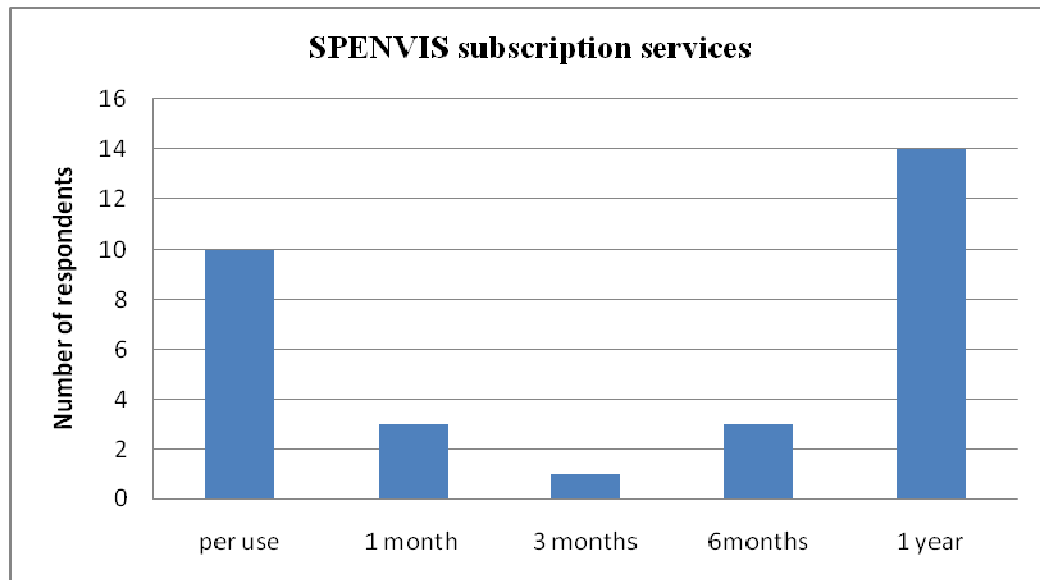


Figure 9 SPENVIS subscription services

From the respondents to the above questionnaire, more than 45% prefer 1 year subscription and around 32% prefer subscription per use.

These results indicate a high level of trust and loyalty to SPENVIS. This is an opportunity for BIRA to set-up a commercialisation and pricing strategies based on targeting customers who use SPENVIS services per use or per 1 year.

4.8 SPENVIS Access

The access to SPENVIS services is directly linked to the customer interfaces discussed in section 4.4 and solutions in section 4.5.

In the market analysis BIRA requested to investigate the opportunities for web-access, locally installed, free limited access, license and group license. Certain users have noted that they already have licensed copy and find SPENVIS access “easy to interface and use” and others have mentioned that they are ready to pay access.

Figure 10, presents a summary of the most preferred type of access among SPENVIS users.

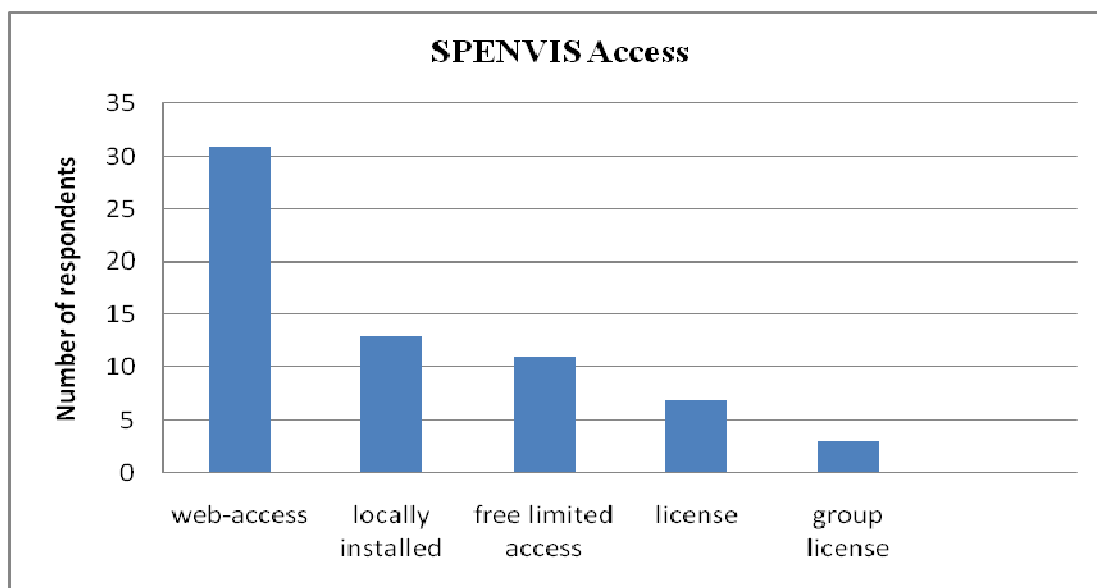


Figure 10 SPENVIS access

For around 73% of the SPENVIS users main preference is web-based access to SPENVIS services and 30% locally installed. Just 26% of the respondents have requested free limited access.

For BIRA this is an opportunity to focus on the development on SPENVIS web-based access and services. They will not require additional software for SPENVIS use and will permit easy customisation. For example users can have a general ‘free limited access’ and then request a paid access to additional space models or extra parameters for the ‘web-access’ services.

The respondents to the survey have also added the following suggestions (Question 17);

- Include Radiation fluxes that provide fluxes for low-energy protons and electrons, for radiation damage assessment for thermal coatings
- Include for the damage equivalent fluxes the available values of the Emcore ATJ solar cells
- Allow for the radiation shielding more detailed models in the sectoring analysis

- Permit the geometry inter charge with existing analysis packages (e.g. Thermica)
- Add impact analysis of micrometeoroids and debris
- Web-based access for ‘ quick and dirty assessments’
- Locally installed with either single CPU or group license
- For paid SPENVIS services users will prefer group licensed access

The future development of web-based SPENVIS services will provide users with a cost-effective, flexible and user-friendly solution. The web-based SPENVIS can also interface with other applications and offer to its users a time-efficient solution.

4.9 SPENVIS Models Contribution

The SPENVIS tool is an interface between various space models and therefore, it is important to have information whether certain users are willing to contribute to it with models and data or not.

Figure 11, presents an overview of the positive and negative answers of the survey respondents.

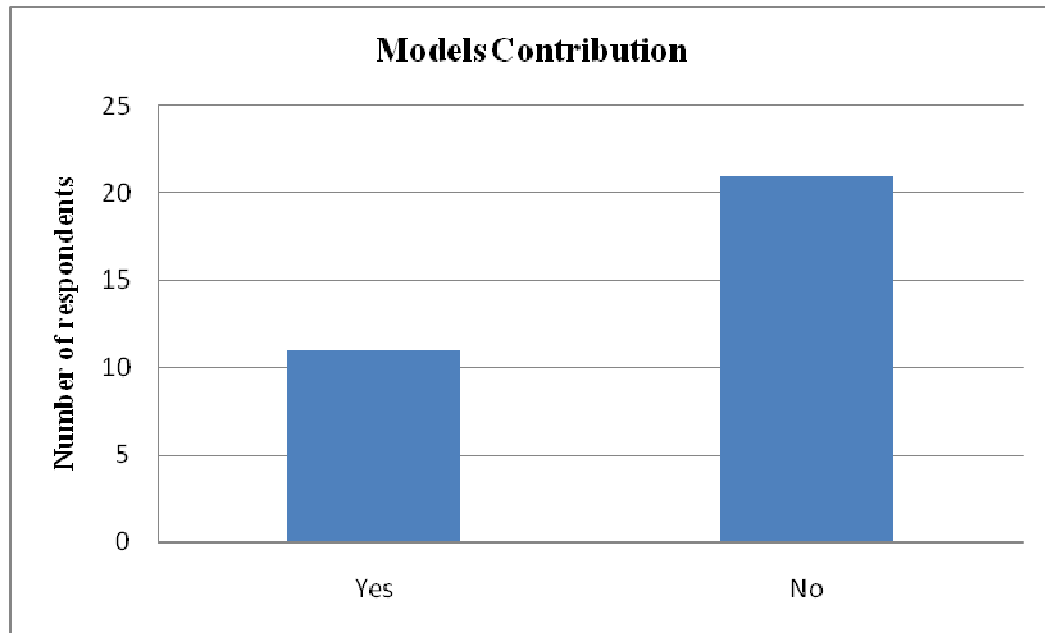


Figure 11 SPENVIS users models contribution

Clearly more than 66% of the respondents have no intention to contribute to SPENVIS with models or data and only 32% respondents are already contributing or are willing to contribute to SPENVIS.

Hereby, is an overview of the contribution made by SPENVIS users:

- SAMPEX proton model
- HEO data for updating models
- Energetic particles
- EM waves
- Fluxes decay time
- Improvement of UNILIB
- Atomic oxygen
- Space radiation models
- Verification data
- In-orbit measurements

➤ New proton model for GEO

The majority of the SPENVIS users are willing to receive a services without the provision of any contribution with models or data.

BIRA should charge high prices to users who do not contribute to the tool and symbolic ones to users who are providing models and data. This price discrimination strategy can be implemented when BIRA would like to update its models and data.

4.10 SPENVIS Future Services

The SPENVIS users as discussed in section 4.5, show that SPENVIS is considered to be an extremely comprehensive, user-friendly and fast tool, supported by excellent services. In addition, the SPENVIS services discussed in section 4.5 and users interface from section 4.4 provide a more detailed understanding of users expectations. Furthermore, certain respondents have made direct recommendations by answering Question 27:

- Unify models
- Add model validation report
- Add more particles and waves
- Improve the quality of graphics from MULASSIS and others
- Faster development of new features
- Pre-check calculation conditions like as geometrical parameters
- Intensive feedback and frequent user meetings
- Good documentation on the use of the models
- Examples of how to use the system and the meaning of the different options
- Update of indexes

Future SPENVIS services should augment the present SPENVIS capabilities and can further expand in towards:

- BIRA can continue to offer user-friendly, comprehensive and flexible tool and have improved graphics and web-site.
- BIRA can offer to its users easy access to CRÈME 96 and access to additional MULASSIS functionalities for extra payment.
- Internet-based subscription access to additional models or parameters
- Internet-based calculations and differentiated support for further customers applications development
- SPENVIS services customisation and differentiation based on the type of customers (see section 4.1) or applications
- SPENVIS educational courses

In the future business model the ‘services mix’ will have to be well defined and information for the customers’ needs can obtained on a daily basis from the a future SPENVIS forum. The services will have to overlap with BIRA competencies and capabilities to provide these services.

4.11 SPENVIS Price

The SPENVIS licenses are divided into educational and commercial ones. Certain SPENVIS users have already paid for a license and others are willing to pay for internet-based services. The educational ones are for universities and research institutes, while the commercial ones for companies. BIRA charges between 2,500-3,000 Euros for educational licenses² and between 5,000-6,000 Euros for commercial ones. The licenses are for a one year period and follow-up support will be 10% of the annual price of the license. The IPR rights are owned by ESA and the distribution rights of SPENVIS by BIRA. In total BIRA has sold three educational and three commercial licenses.

However, in this section there is additional information on whether the users are willing to pay for SPENVIS services. In the market survey only 15 respondents have answered this question and only few have answered that they are not willing to pay additional money for the SPENVIS services. Hereby, is a summary of the respondents answers:

- The price will depend on the improvements made on SPENVIS
- 1000 Euros per year
- User has just mentioned 100 Euros but hasn't defined whether per use or month
- Nothing (tax money should pay for SPENVIS)
- The current competitive price
- BIRA should decide
- Depending on customer contract with BIRA
- Considering buying the local version
- Not familiar with the budget of management
- Zero
- Free is best, but '1\$ per month is OK'
- Depending on the project grant

First BIRA will have to analyse what services it is willing to offer to SPENVIS users. In the earlier analysis it was already recommended (see section 4.7) the prices for future SPENVIS services can be based on a "per use" or per "1 year" subscription services or per "locally installed" (see section 4.8). SPENVIS users can be ready pay extra for access to additional space environment models, interfaces (see section 4.4) and solutions (see section 4.5).

The pricing strategy for SPENVIS services will have to be defined and include analysis of the what type of costs (i.e. fixed, variable, etc.) BIRA is willing recover for the SPENVIS project. Furthermore, it will have to include a proposal of the possible pricing

² The licenses can be used only by one users or by multi-users

models (i.e. breakeven, value-based one, target-return pricing, etc.) and possible profit margins for the extra SPENVIS services.

BIRA as a non-governmental organisation that has no right to generate profits and has the only right to cover its direct costs. The pricing strategy for SPENVIS services will have to permit the project to achieve cost recovery for the services provided by BIRA.

BIRA will have to further investigate the need for a intermediary organisation that has the right to generate revenues on the behalf of BIRA. BIRA can continue to provide educational licenses, but the commercial ones can be provided by the future intermediary. BIRA together with a future intermediary can define the price discrimination strategy for the commercial licenses.

The pricing strategy for SPENVIS services will have permit the project to achieve cost recovery and become self-sustainable.

4.12 SPENVIS Competitors Models

In the market survey Question 24 addressed whether the SPENVIS users use other models. The answers were quite limited and hereby, is a summary of the responses provided by the respondents;

- Use of standalone models and tools, but not as useful as SPENVIS
- Space Radiation
- Omere
- Free FTP sources like NSSDC
- CRÈME96
- NASA GSFC models
- NLR CREME96
- Geant4
- SSCWeb

From the above models six respondents have confirmed the use of CREME 96 and only two use the Space Radiation tools.

CRÈME 96 is a suite of programs for creating numerical models for ionizing radiation environment in LEO, evaluating radiation effects on electronic systems of spacecraft and estimating high LET radiation environment of manned spacecraft[2]. The tool has been created by the High Energy Space Environment Branch at the Naval Research Laboratory and the work has been supported by NASA's Space Environments and Effects (SEE) Program and the Office of Naval Research.

While the Space Radiation is a commercial tool sold by a company Space Radiation Associates and for which the a licensing agreement can be bought.

BIRA has already included CRÈME 86 in SPENVIS and could further include CRÈME 96. However, if SPENVIS is to be commercialised the Space Radiation Associates will be the only available commercial competitor to SPENVIS. Therefore, in the follow-up section 4.12.1 there will be an overview of the services provided by the Space Radiation Associates.

The future business model for SPENVIS commercialisation in WP1220 will have to take under consideration the existence of a commercial competitor.

4.12.1 Space Radiation Associates

Space Radiation Associates develops and sell software which is used for modelling nuclear and space radiation effects on spacecraft electronic systems. The tool permits the predictions of the total dose degradation of semiconductors, solar cell damage, latchup and displacement damage on the spacecraft electronics.

In contrast to SPENVIS which is a intent-based tool the space radiation one is written for Microsoft Windows and it includes a database. The standard space radiation edition includes:

- AP-8 trapped proton models
- AE-8 trapped electronic models
- CRÈME cosmic radiation models
- JPL1991 solar proton model
- IGRF/DGRF magnetic field models
- Total dose from electronics, protons and heavy ions
- Dose equivalent for human exposure

SPENVIS provides the opportunity for its users to access to more models than only the radiation effects ones, as the ones bellow:

- EQFLUX – damage equivalent electron fluencies for different types of solar cells[3]
- SHIELDOSE – ionising dose behind three types of Al shielding
- NIEL – device degradation such as charge transfer efficiency loss in CCDs is estimated by calculating damage-equivalent proton fluencies and non-ionising energy loss
- Sector Analysis Tool is a simple geometric representation of a spacecraft can be generated to produce a shielding distribution by means of ray tracing.
- Multi-Layered Shielding Simulation allows the definition of a multi-layered one-dimensional shield and incident particle source, using the Geant4 toolkit that simulates the radiation transport through the geometry, treating electromagnetic and nuclear interactions.
- CRÈME 96 provide the LET spectra of cosmic ray particles and estimates single-event upset rates in micro-electronics

Space Radiation distributes a license for a period of 90 days and provides a CD and hardware key to be limited of use for 90 days [4]. It is a limited license to be used only one copy or used for a single computer connected to a single terminal.

The Space Radiation Associates can be of a competitor to SPENVIS only for providing space radiation models, because SPENVIS interfaces with more than 31 models [1] for performing the following analysis:

- Radiation sources and effects
- Spacecraft charging
- Atmosphere and ionosphere calculations
- Magnetic field
- Meteoroids and debris

BIRA can commission a intermediary to request a license quote from Space Radiation Associates and gain information on the competitors prices and services. This information will permit BIRA to define better their SPENVIS services and set-up prices that will permit cost recovery for its services.

4.13 SPENVIS Forum and communication strategy

BIRA has set-up SPENVIS forum for its users. This forum can cover a wide range of topics and permit BIRA to directly interface with users and gather market information from the users for their needs.

Figure 12, presents an overview of SPENVIS users' answer on their willingness to participate in a virtual forum.

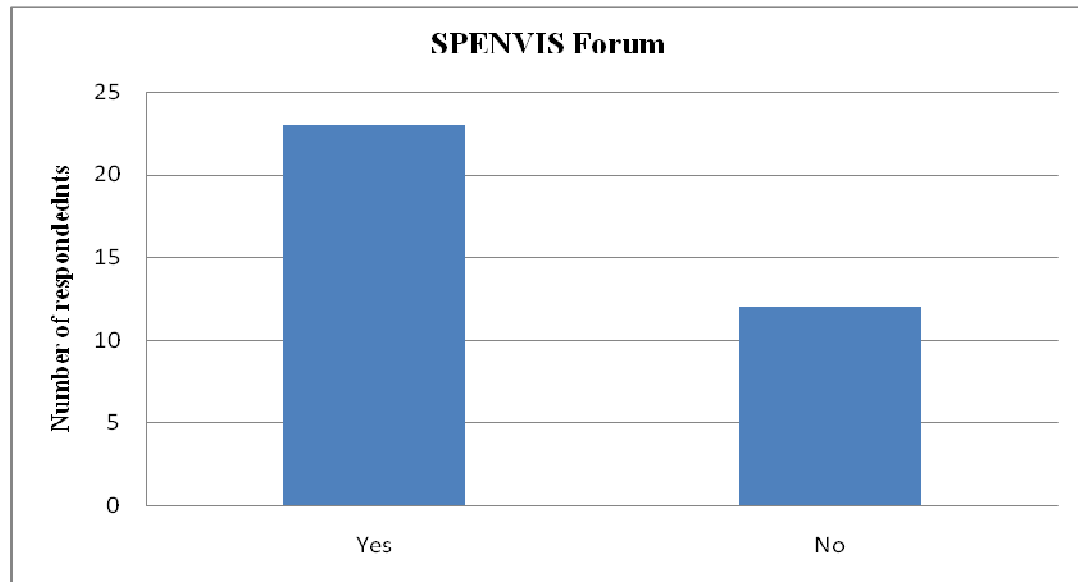


Figure 12 SPENVIS users virtual forum

The SPENVIS users are interested in being interactive and around 66% of the respondents have confirmed their interest in participating in a SPENVIS virtual forum, and 34% respondents have expressed no interest.

The SPENVIS user forum is going to be the communication tool between BIRA and its users. It will be the platform through which BIRA will regularly communicate the models updates and also be able to gather a day to day information on the users' SPENVIS requirements, interfaces and models needs.

4.14 SPENVIS Potential Markets

The few competitors to SPENVIS, as discussed in section 4.12, show that in the markets for commercial space environment models are emerging. In the process of commercialisation of SPENVIS the characteristics typical for emerging markets can be faced by BIRA when implementing the business model.

In emerging markets the following characteristics are typical:

- New markets are created
- First time buyers
- Profits are negative
- Strong government regulation

Therefore, BIRA can experience similar issues when commercialising SPENVIS

BIRA has the competitive advantage, as it already has existing users and is familiar with their needs and expectations from SPENVIS.

The main question to be addressed is what is the available market demand for SPENVIS services. The market survey was answered by 48 respondents which corresponds to around 1% of the active SPENVIS users. Figure 13 presents an initial market demand classification using as a basis the data generated from the market survey. The classification is divided by; penetrated, potential, available and undefined market demand. The penetrated represents a percent of the respondents who admit in the questionnaire they have bought SPENVIS licenses and the potential one who have expressed strong interest in using SPENVIS services. The respondents who have expressed interest in paying for the SPENVIS services are considered in the available market demand assumption.

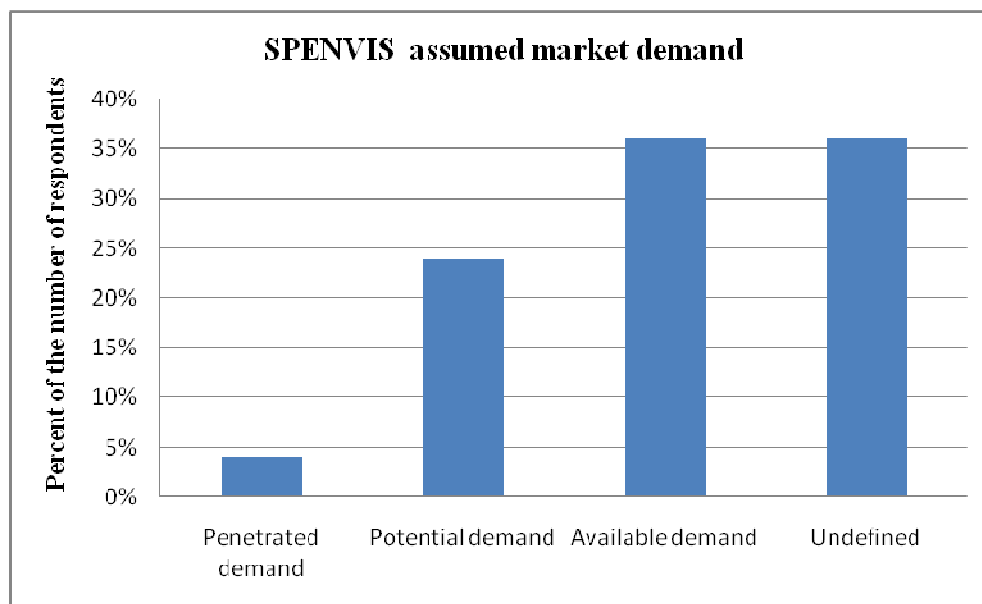


Figure 13 SPENVIS assumed market demand

The available market demand can transform in an actual market demand and is also possible that the potential and undefined market demand to become actual, once BIRA has defined its commercial services and set reasonable prices. In order to be able to develop business models trade-offs it is important to develop various scenarios (i.e. optimistic, realistic, pessimistic, etc.) for the market demand for SPENVIS services

5 RECOMMENDATIONS

The research objectives of this market analysis are to describe the SPENVIS users profiles, usage modes and requirements under WP 1210. In addition, to the above objectives the market analysis provides recommendations on SPENVIS commercialisation.

The main SPENVIS users are universities and research centres (49%) and commercial ones (37%). BIRA can target both US and European commercial users for commercialisation of SPENVIS services.

BIRA can offer to its users differentiated bundle of services for organisations of 100...1000 and ones bigger than > 1000 ones. The overall SPENVIS users are primarily educational, government and military users. BIRA can set-up agreements with these public organisations for the provision of SPENVIS solutions, that are customised to their needs.

SPENVIS is considered to be an extremely comprehensive, user-friendly and fast tool, supported by excellent services, that will need to be considered in the SPENVIS future services definition.

The SPENVIS applications are very diverse and it will be difficult to provide an overall classification of SPENVIS services for a future business model. However, BIRA can use the knowledge of the SPENVIS applications and users requirements for achieving future services augmentation and customisation. BIRA can target users for which SPENVIS is of critical importance for their mission success.

In the future SPENVIS commercialisation strategy and business model definition BIRA should focus on developing customer-based services with a high level of performance. BIRA should further define the resources and competencies, that the organisation is willing to allocate in order to define and develop customer-based services solutions.

BIRA can define 'unique selling point' for justification of charging users a price for using the tool. Furthermore, BIRA can offer to its users easy access to CRÈME 96 and access to additional MULASSIS functionalities against extra payment.

BIRA can improve the online help pages and also increase access to models against payment for services. High, medium and low medium users can have access to different type of parameters, units, spectra, graphics and updated help files. BIRA can set-up its commercialisation and pricing strategies based on targeting customers who use SPENVIS services per use or per 1 year.

In the future business model the 'services mix' will have to be well defined and information for the customers' needs can be obtained on a daily basis from the a future SPENVIS forum. The 'services mix' can incorporate internet-based services or direct customer services provision.

To mitigate SPENVIS disadvantages, BIRA can improve the online help pages, with improved graphics and web-site improvement. SPENVIS web-based services will provide users with a cost-effective, flexible, time-efficient and user-friendly solution and interface with other applications.

BIRA is a non-governmental organisation that has no right to generate profits and has the only right to cover its direct costs. The pricing strategy for SPENVIS services will have to permit the project to achieve cost recovery for the services provided by BIRA.

BIRA will have to further investigate the need for a intermediary organisation that has the right to generate revenues on the behalf of BIRA. BIRA can continue to provide educational licenses, but the commercial ones can be provided by the future intermediary. BIRA together with a future intermediary can define the price discrimination strategy for the commercial licenses.

The pricing strategy for SPENVIS services will have permit the project to achieve cost recovery and become self-sustainable.

The models CRÈME 96 and Space Radiation are competitors to SPENVIS. SPENVIS has already CRÈME 86 in the space environment models and can further include CRÈME 96. However, if SPENVIS is to be commercialised the Space Radiation model will be the only available commercial competitor.

BIRA can commission a intermediary to request a license quote from Space Radiation Associates and gain information on the competitors prices and services. This information will permit BIRA to define better their SPENVIS services and set-up prices that will permit cost recovery for its services.

The future business model for SPENVIS commercialisation in WP1220 will have to take under consideration the existence of one commercial competitor.

In order to be able to develop business models trade-offs it is important to develop various scenarios (i.e. optimistic, realistic, pessimistic, etc.) for the market demand for SPENVIS services.

The available and undefined market demand can transform in an actual market demand, for a an extremely comprehensive, user-friendly and fast tool as SPENVIS.

6 ANNEX 1: MARKET QUESTIONNAIRE

1. What is the size of your organisation?
2. Is it a public or private organisation?
3. What's the geographical location of your organisation?
4. Are you a heavy, medium or low user of SPENVIS services?
5. What are the major applications for which you use SPENVIS services?
6. How much are you willing to pay for SPENVIS services?
7. How do you prefer your mission specification to be transferred to SPENVIS?
8. Do you have suggestions regarding the transfer of your mission specification to SPENVIS?
9. What are the most important SPENVIS requirements for you?
10. Do you have any suggestions regarding SPENVIS requirements?
11. How do you think the SPENVIS customer interface and services can be improved?
12. Do you have suggestions regarding the improvement of the customer interface and services?
13. How do you imagine the SPENVIS solutions?
14. Are you willing to receive subscription services?
15. Do you have any suggestions regarding subscription services?

16. What type of SPENVIS access would you like to have?
17. Do you have any suggestions regarding the type of SPENVIS access you would like to have?
18. Will you be willing to contribute to SPENVIS with models and relevant data?
19. What type of contributions are you willing to make?
20. Are you willing to pay for SPENVIS services?
21. What do you like about SPENVIS services in comparison to competitor ones?
22. What do you dislike about SPENVIS services?
23. Do you use other services?
24. What other services do you use?
25. What are your recommendations for improving the quality of SPENVIS services?
26. Are you interested in receiving the results of the SPENVIS market analysis?
27. What are your recommendations for improving the SPENVIS workshops?
28. Do you have any suggestions regarding the improvement of the SPENVIS workshops?
29. Are you interested in hosting SPENVIS events?
30. Are you interested in participating in a virtual SPENVIS forum?

7 REFERENCES

1. SPENVIS, User Requirements Documents (URD) Draft 1.0, prepared by J.Wera, BIRA
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3. <http://www.spervis.oma.be>
4. Space Radiation Associates, www.spacerad.com