

Building long-term constituencies for space exploration: The challenge of raising public awareness and engagement in the United States and in Europe

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ABSTRACT

Space exploration is a multifaceted endeavor and will be a “grand challenge” of the 21st century. It has already become an element of the political agenda of a growing number of countries worldwide. However, the public is largely unaware of space exploration activities and in particular does not perceive any personal benefit. In order to achieve highly ambitious space exploration goals to explore robotically and with humans the inner solar system, space agencies must improve and expand their efforts to inform and raise the awareness of the public about what they are doing, and why. Therefore adopting new techniques aiming at informing and engaging the public using *participatory ways*, new communication techniques to reach, in particular, the younger generation will be a prerequisite for a sustainable long-term exploration program: as they will enable it and carry most of the associated financial burden. This paper presents an environmental analysis of space exploration in the United States and Europe and investigates the current branding stature of the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). We discuss how improved market research and new branding methods can increase public space awareness and improve the image of NASA and ESA. We propose a new participatory approach to engage the public as major stakeholder (along governments, the industrial space sector and the science community) that may provide sufficient resources for and sustainability of a long-term space exploration program.

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1. Introduction

Public interest in and support of space activities, is widely acknowledged in the space community as being fundamental to sustaining long-term international space exploration programs. The new era of “space exploration” defined as “to explore robotically and later with humans, Moon, Mars and near-Earth asteroids” can be an opportunity to inspire, motivate, and involve an ever increasing

number of countries. In the 1950s and 1960s, the “space race” brought excitement to many people [1]. Even today, in the United States the image of the National Aeronautics and Space Administration (NASA)¹ and the space program is still influenced by the pioneering space endeavors that took place during the Cold War, such as the Apollo program. However, today space missions lack the flare of those past events and appear to have become almost routine and mundane. In Europe, the European Space

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¹ <http://history.nasa.gov>

Agency (ESA) has no brand equity comparable to NASA despite successful milestones since its establishment in 1975 including the Ariane launcher system, the Columbus laboratory and the Automatic Transfer Vehicle ATV, two crucial elements of the International Space Station (ISS). ESA is far less recognized than NASA, even in Europe.

Today, governments and societies consider environment, the economy, the fast growing population and climate change as higher priorities than human activities in Low Earth Orbit (LEO) and the exploration of the solar system. This is due to the evolution of perception from a “need to know” to a “nice to know” approach, as well as the necessity to have standard observations of our home planet to monitor its changes. Space probes and satellites are launched all over the world nearly every week but their purpose is often obscure and they remain far removed from the public’s everyday consciousness [2]. In particular, the younger generation (between 18 and 25), as evidenced from recent US marketing studies, is least interested in space endeavors [3].

The lack of support from the public for space programs is a complex issue. Despite many efforts and initiatives in the 21st century of NASA’s previous Office of Communication Planning (OCP), public information policy surveys, marketing and advertising studies [4] resulted in similar conclusions concerning the public awareness of space activities [5–7]. An important finding is that the part of society that supports the space program and believes that space exploration is a noble endeavor does not necessarily agree that governments should allocate substantial financial resources to achieve those exciting space missions [8]. Even during the Apollo era, polls showed that the public did not approve the large governmental spending [1]. A survey in Europe in 2007 showed that space activities are perceived risky, expensive and not very useful by a large part of the population [9]. The recent survey on space activities of the European Union (EU) in July 2009 conducted by Gallup showed that a majority of 63% of EU citizens regards European space activities as important in the EU framework [10]. However, a majority is either against or not sure if the EU should invest more in space exploration.

The new era of space exploration will have social, cultural and economic impacts and involve apart from science and engineering also economics and social sciences including anthropology, religion as well as arts [11]. Established space powers and new players will try to master technological advances in international cooperation to create a sustainable space exploration program that embodies many different cultures [12]. Public support will play an important role in this context, in particular since it is difficult to defend large scale space endeavors in those economically challenging times.

To achieve public support for space exploration, nationally and internationally, and to channel advanced knowledge, participation and understanding into support of higher governmental spending requires a strong effort in public outreach and education activities. The recent NASA budget proposal (FY2011) of 20 million US dollars for its education program to fund several new initiatives represents an important step to regain the interest of the

public. However, how can society become an integral part of a global space exploration program? What can be done to connect the public with space exploration and to reverse the perception that space exploration is an exclusive and separate remote endeavor? How can media and education methods keep up with the change in demographics of workforce, globalization, and with new communication techniques? How can we solve the paradox that public support does not correlate with the agreement to larger funding allocations for space exploration?

To answer those questions and develop adequate and resilient strategies to make the public a major stakeholder of space exploration it will require: (i) to perform improved and unbiased surveys and market research to obtain accurate demographic information on the population segments to target, (ii) to revive the brand of space agencies using methods that are commonly used in the commercial industry to bond with customers, and (iii) to implement participatory education and outreach strategies that transform the public stakeholder into an integral part of future space exploration endeavors.

In this paper we analyze the macro- and micro environment for space exploration in the United States and in Europe and investigate the current brand status of NASA and ESA. We review established marketing research and surveys that give us access to current demographic information. We discuss how new branding methods could help to raise the image of NASA and ESA. Finally, we investigate new participatory ways to engage the public to participate as a major stakeholder in future space exploration programs. Enabling public participation in space exploration policies may foster government–citizen partnerships and new avenues of space commercialization may strengthen the link between industry and society. Participatory public engagement in space exploration may be the key to improve public understanding on timescales, costs and government spending for large space endeavors and lead to long-term public support and sustainable funding.

2. Scanning the environment

In order to define a strategy to raise public awareness and engagement for space exploration it is necessary that space agencies and governments define their mission and major goals like any other commercial business. This includes monitoring their internal strengths and weaknesses (micro-environment) as well as their external opportunities and threats (macro-environment), using for instance a SWOT analysis, a routine procedure in the commercial sector. Tables 1 and 2 summarize the internal environment of NASA and ESA, respectively. Several main parameters such as vision, entrepreneurial orientation, communication, corporate culture and others were investigated. Data have been compiled from the official NASA and ESA websites and sources indicated in the Table captions.

NASA’s pioneering image is not anymore sufficient to inspire the young generation to support space activities in

Table 1

The internal environment of NASA: strengths and weaknesses.

NASA	Major strength	Minor strength	Minor weakness	Major weakness
Organization reputation	Historical image Pioneers in space exploration Human space flight program	International cooperation ISS Launchers, space probes and vehicles	Delays and cancellations of space missions Eroding brand	High risk of failure Short-time orientation Lack of public support
Promotion strategy	Web/TV coverage of space missions NASA TV New stimulus for EPO activities	Podcasts, blogs Images, videos Unique advertising	Lack of international dimension Many substitutes	Limited success to engage the young generation Small market segment
Innovation R&D	Space infrastructures Space transport Space applications	Spin-off technology Jobs in space industry	International traffic and arm regulations Re-use of space systems	Slow development of new technologies High costs Cost overruns
Visionary leadership	50 years of discoveries Decadal surveys New exploration R&D program	New space initiatives Stimulus for space cooperation	Political influence Lack of interagency cooperation	Short-term orientation Frequent changes and cancellations of space programs
Flexibility and responsiveness	Technology demonstration program Small programs: SCOUT, SmallSats	Flexible path Ability to respond to failures	Inertia in response to global challenges	Complexity of infrastructures Bureaucratic administration
Entrepreneurial orientation	Commercial cargo opportunities Contracts to space entrepreneurs for development of new spacecraft	High governmental costs inspire entrepreneurs to provide alternatives	Prototype technology is difficult to spin-off for commercial market	Limited intrapreneurial orientation within the agency
Communication	Media events Community activities New PR stimulus	Websites Interactive features	Outdated communication practices Limited surveys	Limited internal agency communication
Corporate culture	Corporate values: knowledge, technological progress and inspiration	Serving and educating the community	Slow adaptation of personnel to social change	Internal competition between centers, projects and funding

Data were compiled from the official NASA website, <http://history.nasa.gov/>, the FY2011 budget estimate, as well as Refs. [1,4,5,6,12–14]. EPO – Education and Public Outreach.

general, and space exploration in particular. NASA's previous OCP developed long-term communication strategies by organizing strategic communication workshops and performing market research analysis [13]. However, frequent changes and cancellations of space missions and programs make it difficult to sustain public support. The new directions for NASA announced at the occasion of the release of the FY2011 budget (presented in February 2010) indicate a paradigm shift for NASA's human space-flight program that will in the future rely on substantial support from the commercial sector. A strong push for innovation and technology development indicates a system change for NASA departing from a mission-oriented approach. The new initiative to increase funding for higher education in Science Technology Engineering and Mathematic (STEM) programs will also be a stimulus to form a new generation that is an integral part of space exploration.

ESA is an inter-governmental organization that has currently 18 Member States. Member States participate in mandatory and optional space programs. ESA is

structured very differently compared to NASA, it has to reconcile the interests of its Member States with different national interests, languages and support. It has a long-standing tradition of space exploration, and has participated with outstanding success in many activities on its own and in partnership with other space-faring countries. It has made significant contributions to human spaceflight and robotics missions. ESA has recently demonstrated its willingness and capability to provide essential contributions to the ISS through the Columbus orbital laboratory, the Automated Transfer Vehicle (ATV) and other ISS infrastructures (node 2, node 3). ESA is an equal partner within the ISS partnership, along with the United States, Russia, Japan and Canada and is currently the main scientific user of the ISS. ESA has also developed a long-term cooperation with NASA to use all opportunities to go to Mars, starting with ExoMars in 2016 and 2018.

As many large organizations, NASA and ESA suffer from extensive bureaucracy and a lack of intrapreneurship. In this context it has been recently proposed that participatory exploration can serve as a bridge between the culture

Table 2

The internal environment of ESA: strengths and weaknesses.

ESA	Major strength	Minor strength	Minor weakness	Major weakness
Organization reputation	Uniting Europe's space activities Community service Access to space	Supports space development in Europe Launchers, space probes, ATV	Competing space programs coordinated by the European Union	No decision-maker No real brand Limited public awareness and support
Promotion strategy	ESA television ESA website Exhibitions Media interface	Images, videos EPO activities Press releases	Interagency media coordination Many substitutes	Multi-language cultural challenge Small market segment
Innovation R&D	Advanced concepts Space transport Space technology Space infrastructure	Spin-off technology Jobs in European space industry	Geographical return policy Lack of human spaceflight capabilities	Time consuming decision process for technology development Limited resources
Visionary leadership	Shapes Europe's space capability Long-term future space program Largest scientific user of the ISS Cosmic vision	Aurora space exploration program International space cooperation	Member States influence on space programs Tri-annual council at ministerial level	Long timescales for the realization of new missions Strong dependence on government funding
Flexibility and responsiveness	Regular new missions Frequent international cooperation	Broad portfolio Ability to respond to failures Expanding frontiers	Inertia in responding to new adventures Risk aversion	Complexity of ESA Member States coordination Bureaucratic administration
Entrepreneurial orientation	Collaborations with aerospace industry Support for small medium sized enterprises SME	ELIPS program Technology transfer Incubator program	Limited entrepreneurial spirit and innovation in EU countries	Limited intrapreneurship within ESA Regulations
Communication	Media events Community outreach and education activities	Websites Student programs Teacher training Hands on activities	Uncoordinated press activities between ESA and Member States	Limited media budget allocation Competition with EU programs
Corporate culture	Corporate values: improving daily life, Europe's benefits, protecting the environment	Serving and educating the European Member States Multicultural	Balance goals and geographical return for Member States Support of only 18 European countries	Hierarchical, autocratic, bureaucratic culture Low percentage of female executives

Data were compiled from the official ESA website, as well as Refs. [12,22,23]. EPO (Education and Public Outreach); ELIPS (European Program for Life and Physical Sciences and Applications).

of a large government bureaucracy and a new generation of scientists and engineers familiar with new communication techniques to create a more sustainable process for innovation and problem solving [14].

Tables 3 and 4 list the macro-environmental analyses of the US and European space program, respectively. A macro-environmental matrix allows the investigation of the external environment, trends and corresponding strategies. There are six major environmental forces that need to be investigated: economic, demographic, technological, legal, political and socio-cultural. The economic situation is important and may affect the support for large-scale space endeavors. In the United States a growing number of health and environment conscious citizens are more interested in career opportunities and quality of life than in space projects. The democratic government in the US has increased the budget of NASA

for six billion dollars over the forthcoming five years (as described in the FY2011 budget). It is anticipated that the involvement of new stakeholders, such as commercial space industry partners and space entrepreneurs will lead to the development of innovative technologies and a more flexible space program. An important goal on the US agenda is the revision of trade regulations such as International Trade and Arms Regulations (ITAR). In Europe, a recent European Commission (EC) study on the cultural values of Europe States showed “a clear belief that European society(ies) should preserve certain key values, especially peace and respect for nature and the environment” [15]. Concerning European space activities, security aspects and environmental concerns have clear priorities. ESA is currently working together with the EU to establish Europe's global competitive position in space exploration.

Table 3

The macro-environmental matrix for space exploration for the United States.

USA	Trend	Strategy
Economic	Recession of economy Debts, health care and the fall of the U.S. dollar are important issues of concern	Emphasize the low amount of the space budget relative to the federal budget (0.6%) and highlight the importance of the space sector for economy
Demographic	Median age of population is >45 Baby boomers are supportive of NASA's space program Young adults are unaware of the space program and indifferent	Engage the 30+ generation in participatory ways in space exploration through consultation and collaboration Target the young generation: inform and excite
Technological	High involvement of citizens with the internet New challenges of NASA are the prolongation of ISS lifetime and the development of commercial cargo capabilities and human transport systems Space tourism is emerging	Strengthen the link between industry and society Develop interactive tools (e.g. games, webcams, blogs) that connect people with elements of the space program Involve public actively in space activities (e.g. habitat training, parabolic flights, ISS tours)
Legal	International Traffic and Arm Regulations ITAR restrict space cooperation Agreements/treaties need to be upgraded	Facilitate trade regulations for the space sector and promote the subsequent advantages
Political	New US government changed NASA directions to develop innovative technologies, foster new industries, strengthen Earth sciences and STEM education	Promote space exploration as a social cultural and economic endeavor that enhances cooperation worldwide and cross cultural relations
Social and cultural	Growing number of health and environment conscious citizens In particular young people are more interested in jobs and career opportunities	Foster the aspiration of the public to explore the unknown: engage and excite Highlight the advances of space technologies that are used in every-day life

Data were compiled from the NASA FY2011 budget as well as Refs. [4,8,12].

3. The missing link: the public stakeholder

Ambitious space exploration programs will be long-term endeavors that span over several decades. A successful implementation needs therefore the resilient support of many generations and particularly the ones to come. It is thus important to obtain accurate demographic information of target groups to understand better attitude and desire of population segments and to educate and raise public awareness. Most of all new communication methods need to be developed that keep up with societal changes and make public support and engagement sustainable [16]. This issue has been raised in the "Global Exploration Strategy: The Framework for Cooperation".²

The GES report was recently issued by a consortium of fourteen space agencies.³ In the framework of its executive body the International Space Exploration Coordination Group (ISECG) the working group "Enhancement of Public Engagement", led by DLR (German Aerospace Center), identifies key elements for public engagement that could be used by participating agencies to promote exploration [17].

² The Global Exploration Strategy: The Framework for Coordination 2007 http://esamultimedia.esa.int/docs/GES_Framework_final.pdf

³ The fourteen agency signatories of this strategy are the national space agencies of Australia, China, Canada, France, Germany, India, Italy, Japan, Russia, South Korea, Ukraine, the United Kingdom and the United States and ESA.

3.1. Market research, surveys and how they can be improved

Analyzing the demographic environment is often seen as a prerequisite to define how to target an audience most successfully, through marketing or active engagement. Population growth, changing mixes of age, gender, educational training and ethnic heritage play a role in understanding the demographic force.⁴ Life development stages strongly influence as well the opinions and values of society and their support for a space exploration program. From recent US marketing studies it is evident that NASA receives its major support from the "Apollo generation". NASA has investigated the public opinion using mainly commercial surveys (not academic), whose limitations have been discussed [18,19]. The response to the Vision for Space Exploration⁵ (VES) was investigated by polling 1029 US citizens by phone between August and November 2004 [4]. The results showed general awareness of space programs and that the majority of men and women are supportive. The attitude toward the VSE was to support ISS completion, robotic missions and the return to the Moon. Citizens were, however, opposed to human missions to Mars and in particular the associated risks. Similar to Europe, US citizens are totally unaware about the costs of NASA in US budgetary perspectives. The public also perceived that public outreach is poorly executed. In 2005–2006, 450 US citizens aged 18–24

⁴ <http://www.dittmar-associates.com>

⁵ The vision for space exploration, February 2004 (PresidentBush) <http://www.whitehouse.gov/news/releases/2004/01/20040114-3.html>

Table 4

The macro-environmental matrix for space exploration for Europe (includes collaborations with Russia).

Europe	Trend	Strategy
Economic	The economy is less stable in 2010 in many European countries Newcomer economies Security and environmental concerns are dominant Uniting Europe is a priority	Emphasize the cooperation of European countries to exert leadership in space exploration Highlight the importance of the space sector for European economy
Demographic	Europeans of all ages are rather unaware of the European space program Four countries (F, I, D, UK) dominate the space program New countries entering the EU need to be integrated in future space programs	Target new economies and industries that can be integrated into the space sector Balance tasks and involvement among the European countries (dominant and small)
Technological	New challenges of ESA and the EU are Galileo and GMES/ Kopernikus Essential contribution from Europe to the ISS (Columbus, ATV, Cupola) International Mars program Upgrade of launchers	Strengthen the link between industry and society Involve public actively in space activities (e.g. habitat training, parabolic flights, ISS) for space exploration
Legal	Harmonization of separate legal processes throughout Europe The EU tries to ease import and export controls	Improve European cooperation within the space sector Expand global space cooperation
Political	Budget decision for the future European space program (2012) ESA is working together with the EU to establish the “EC strategy and associated budget for European exploration activities” in 2010 The European Space Policy will be implemented in the forthcoming years	Promote space exploration as a social cultural and economic endeavor that enhances cooperation worldwide and cross cultural relations Foster Europe's competitive position in space systems
Social and cultural	Prioritization of space technology for the benefit of Earth Fear of globalization	Engage the public in the advances of space technologies that improve conditions on Earth Emphasize global success

Data were compiled from Refs. [9,10,11,12,15,23]. F, I, D, UK is the abbreviation for France, Italy, Germany and England, respectively.

participated in another study and were contacted via internet tools [3]. Only 50% were aware about the VSE, 27% expressed doubts that NASA went to the Moon, 39% said that NASA does not do anything useful and 72% thought NASA money should be better spent elsewhere.

The US perception of space exploration has been analyzed by the Center of Cultural Studies and Analysis [8]. Surveys, focus groups and tracing long-term historical patterns and behavior are suggested as the best strategies to gain insights into public awareness and support for space. The study indicates that the core values of the US include “that the future should be better than the past”. The lack of popularizers and outside driving forces limits also the actions of motivating people to endorse a long-term space program. Information from existing studies allow us to establish a consumer segmentation matrix that takes into account stages of personal development and lifestyle. Educational groups play an important role as well.

Illiterates, high school dropouts, high school diplomas, college degrees and professional degrees are categories that are used as statistical tool. More detailed insights into the demographic differences including income, gender, social class and other parameters are needed to be able to better target those groups with appropriate communication techniques.

Table 5 shows that the majority of the population in the United States is over 50. In order to reach short-term goals this large population segment has to be targeted. To educate and engage the smallest segment of young adults is, currently, the most important exercise. The generation

Y (1975–1995) has already been addressed in a recent NASA outreach document.⁶ This generation will constitute the decision-makers within the next 10 years, but it is distinct from other generations as it has been growing up with the internet and is heavily immersed in the digital world. Members of this generation require thus constant stimulation in order to concentrate and are trained to multitask. They cannot be reached through books or newspapers and less and less by television. The space generation, representative of young adults who are interested or involved in various space activities presented recently their creative visions.⁷

Space perception by the European public has recently been investigated [9,20]. Surveys of 1000 individuals in France, Germany, Spain, and Italy showed that respondents had a wrong perception of benefits and costs for space exploration and were often not able to distinguish between European space endeavors and programs conducted by other space-faring countries [9 and reference therein]. Europeans are not aware that Europe and ESA play an important role in space and have a significant share in the world market (50% for launchers and about 30% for satellites) and that citizens pay in average only 11.2 Euros per year for space expenses in EU and ESA countries. A more recent study was conducted by the Gallup institute for the European Union in July 2009

⁶ <http://www.opennasa.com/2008/02/19/generation-y-perspectives/>

⁷ <http://www.spacegen.org>

Table 5

Consumer segmentation matrix for space exploration in the United States.

Space	Teenagers	Young adults	Interested Adults	Baby Boomers and older
Segment size	~15%	~10%	~25%	> 50%
Age and gender analysis	13–18 can be inspired	18–25 occupied with managing life	25–40 future and goal oriented	40+ mature thinkers, responsible
Psychographic lifestyles	Computer-oriented “Dreamers”	Enthusiastic “Experiencers”	Multi-tasking “Innovators”	Traditional family union “Believers”
Personality traits	Daring, immature followers	Open and active, planning, impulsive	Self-confident, success-oriented	Reliable and down to Earth
Benefits sought	Astronaut training, excitement	Experience, enrichment	Benefit from technology	History, tradition, knowledge
Behavioral analysis	Looking for variety and fun	Intensive lifestyle	Balancing life/work	Favor durability and value
Overall segment rank	3	4	2	1

Segment size and gender analysis are scaled to the US census 2000.

[10] where 25,000 randomly selected citizens aged 15 and over were tested in 27 EU Member States. Fixed telephone lines, mobile phones as well as face-to-face interviews were used to obtain results on the perception of space activities and the EU. The majority of the citizens polled believe that European space activities should be pursued by the EU. However, as discussed before priority was given again to environmental monitoring systems (58% found this very important). The question of whether the EU should be more involved and pursue space exploration more actively profoundly divides European citizens. About 26% believe that the EU should definitely do more, while a similar number of respondents oppose further involvement (28%). A relative majority (38%) is not entirely convinced about the necessity, but feels that the EU should *perhaps* put more emphasis on this field. This indicates only 30% of supporters who are committed to space exploration in Europe.

Surveys and market research have to be improved as well and better adapted using new communication methods. How reliable and informative are the methods of demographic analyses and marketing studies? Weaknesses of public opinion polling and public opinion research include a lack of reporting on survey non-response rates and insufficient research on the sources and effects of non-response [18]. Survey researchers have also found bias in the other directions: people who are interested in the topic of a survey are more likely to respond to it, and this factor can bias survey results [19]. In addition, polling is still subject to what practitioners call non-sampling error, that is, non-quantifiable sources of error or uncertainty ranging from vague leading questions, interviewing problems, biased interpretations, the context and timing of surveys, the demographics of interviewers and respondents and the phrasing and order of questions and response options. Therefore future marketing studies should be properly evaluated.

3.2. Branding and tactics to raise public awareness for space exploration

The brand analysis of NASA and ESA using different models provides clues to the perception of both agencies

by the public. Aaker⁸ has developed a comprehensive brand identity planning model for commercial business with five main brand assets: brand loyalty, brand awareness, perceived quality, brand associations and other proprietary assets [21]. His model of brand identity includes 12 dimensions from product quality to symbols. It emphasizes the concept of a core identity and an extended identity for brands.

In the case of space exploration for NASA, the *core identity* could be: “the agency that pioneers space exploration and commits to serve the citizens on Earth”. The *extended identity* could include: “a space agency that provides the access to space and innovative technology for the benefit of humanity; inspirational and educational; excitement for every citizen”.

ESA has defined several cornerstones in the framework of its long-term strategy for space exploration; among them are to support European projects, to increase knowledge, to improve human living conditions and to foster broader engagement [22]. Therefore the *core identity* of ESA could be: “the agency that boosts European space excellence” and the *extended identity* could include: “a space agency that unites European efforts in space technology, supports entrepreneurial activities and inspires a new space generation”.

In the brand resonance model (developed by Millward Brown and WPP) the first step is to ensure the identification of the customer with the brand because “*bonded*” consumers develop stronger relationships with the brand [21]. The combined information of brand associations, motivation, judgment and feeling of consumers is used to convert the brand interest into a long-term, intense relationship between brand and customer.

The pyramid illustrated in Fig. 1 indicates the duality of brands. The left side displays the rational route and the right side describes the emotional route of NASA and ESA. The rational route includes economic goals, technology development and the access to space whereas the emotional route expresses the aspiration of humanity to explore the unknown, to learn and to participate in new discoveries.

⁸ D. Aaker, Building Strong Brands, (1996) The Free Press.

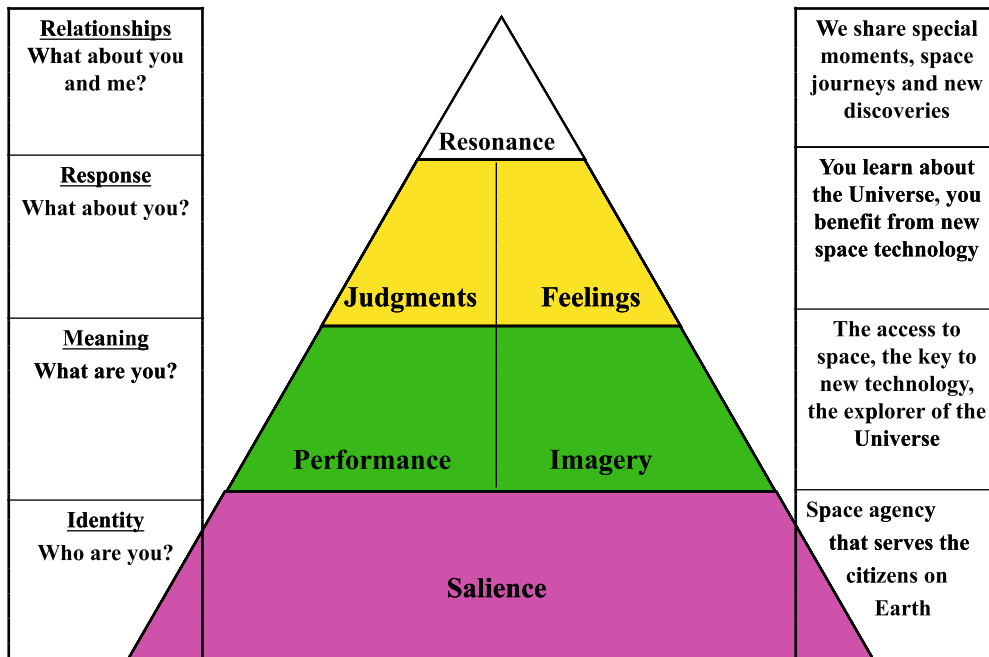


Fig. 1. Brand resonance pyramid for NASA and ESA. Adapted from Kotler and Keller [21], Fig. 9.2.

Significant brand equity (an intangible asset that depends on associations made by the consumer and represents the added value endowed to products and services) can only be reached when all building blocks are put into place and are efficiently combined. An important step to build up brand equity is to develop brand identity. However, how can space agencies reach brand resonance? Public awareness concerning the space program is low. Step 1 of the pyramid is already a failure because many people are unaware of NASA's and ESA's programs and their relevance. To strengthen the brand and to secure an intense brand loyalty will require a stepwise approach up this pyramid. A good start can be achieved by choosing the right brand elements (see Table 6).⁹

The Brand Asset Valuator (BAV) is a database of consumer perception of brands developed by Young and Rubicam.¹⁰ BAV combines four components: differentiation, relevance, esteem and knowledge. The differentiation and relevance build together the brand strength and determine its future potential.

As Fig. 2 shows, the brand equity of space agencies such as NASA and ESA has several pillars. Space technology and endeavors represent a small market segment in the every-day life of society. However, this market segment appeals practically to everyone. Extraordinary discoveries excite society at large. On the other hand, compared to past successes the image of the NASA brand is currently eroding as seen in the brand stature that is determined by knowledge obtained in the past and esteem, a value that is declining in the case of NASA.

To revive the brand it is important to strengthen all the four pillars described in Fig. 2. To communicate the relevance of the current program represents a first step in the right direction.

Brand equity can be reinforced by marketing actions that convey the core values of the brand and reinforce the unique brand associations. NASA needs to revitalize its brand due to a shift in demographic and economic environment. Europe's space program represents a mixed program that combines national, international space activities as well as bilateral agreements. This overlap complicates a clear vision and consequently the promotion of a true "European space program" [23]. Furthermore strategic communication suffers from the hierarchical structure of media communication involving several ESA directorates and centers, national media offices and organizations and the challenging multilingual environment. ESA has therefore not reached its potential in brand equity. A coherent promotion of a European space strategy supported by the EU and a centralized communication directorate at ESA could improve media coverage and the image of ESA and consequently increase brand stature.

In conclusion it has to be noted that NASA and ESA take their identities from their legal mandates, therefore the idea of selling and marketing the space program will have to satisfy those criteria.

3.3. New participatory strategies to engage the public as major stakeholder

As aforementioned public opinion research and studies of public understanding of science and technology have shown how and explored why public interest does not

⁹ Protectible stands for: how can the brand element be legally protected?

¹⁰ BrandAsset Consulting.

Table 6
Examples of NASA and ESA brand attributes and brand criteria.

Brand elements	Brand criteria
Pioneers in space: first satellites, first Moon landing, space stations New discoveries	Memorable, adaptable, protectible Meaningful, likeability, transferable
Access to space	Meaningful, adaptable, protectible
Cutting-edge technology	Meaningful, adaptable, transferable
Inspiration Public involvement	Likeability, memorable Meaningful, likeability, memorable

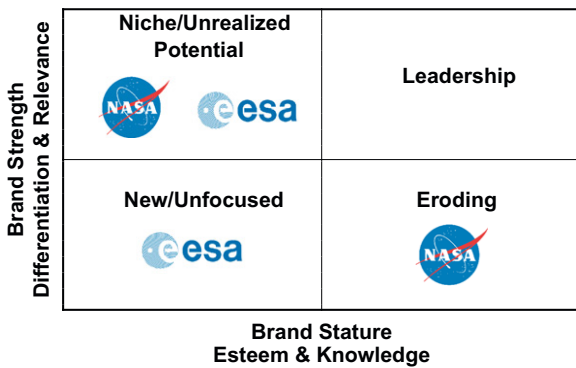


Fig. 2. Brand strength versus brand stature for NASA and ESA. Adapted from Kotler and Keller [21], Fig. 9.1.

equate to public understanding and how and why neither interest nor understanding equates to public agreement or support [24]. Space agencies have an obligation to ensure that their programs serve the public interest [25]. Informing and engaging the public using new participatory ways, new communication techniques to reach, in particular, the younger generation, will be therefore a prerequisite to make a global space exploration program acceptable for the large societal stakeholder. Marketing strategies and branding as discussed in the previous sections are ways of raising public awareness but might succeed only as a short-term strategy. To ensure long-term public support, however, broad, ongoing, and meaningful public participation in exploration policy and planning will be necessary to build an exploration culture across generations.

Currently used strategies and tactics to raise public space awareness are listed in Table 7. Internet and special communication tools such as blogs, podcasts, videos on YouTube, Facebook, Twitter are being integrated in revised education and communication programs. A focus on up-gradable technology, compatible systems and the development of multi-age, multi-stage projects and multi-lingual tools will allow in the near future to keep up with the fast pace of changes in media communication and globalization.

New commercial space activities managed by non-profit organizations and entrepreneurs including habitat training and space tourism provide opportunities for the general public to participate actively in space exploration. Currently the participation in space experiments, parabolic flights, and televised tours of the ISS are not accessible to a large audience. Over the next two decades space exploration may shift strongly toward more involvement of the commercial sector [26]. This trend will reinforce commercial space activities and strengthen the link between industry and society. The new era of space exploration foresees national engagement of all stakeholders (government, industry, scientific community, public), cross-fertilization and idea exchange among them, as well as a common decision-making process and convergence toward agreed-upon objectives. When engaged in such participatory ways the public could be a powerful stakeholder in terms of influencing governments to provide a long-term increase in the resources invested in the space sector and support decision makers' choices.

New initiatives of the NASA education program that will be implemented in the near future are the *Summer of Innovation* that will pilot programs over three years involving NASA scientists and curricula to inspire middle-school students and their teachers. Other elements of the new stimulus for NASA education include "innovation in higher education STEM programs and innovative approaches to conduct informal education in the Nation's science centers, museums, community groups, and other organizations".

Incorporating public participation into the process of government planning and policymaking is not easy. Nonetheless, given ongoing concerns in the space community about public understanding and support, it may be a step that space agencies cannot afford to forego. The benefits of enabling public participation in space exploration policy and planning—through mechanisms such as community consultations, citizen advisory boards, and policy dialogues—are that it can minimize conflict, foster government–citizen partnerships, and temper the influence of large and powerful interest groups. This approach is more complicated and time-consuming than conventional bureaucratic consultation practices. However, research has shown that the long-term benefits can be worth the effort [24,27–31].

It is important for the space community to consider that public involvement or engagement to obtain public "buy-in" is "participation in name only" [32]. Power sharing is necessary for participatory government to work. Giving citizens a say in the exploration policy-making and planning process may be the way toward ensuring that taxpayers will take ownership of space exploration and that national scientific and technological capabilities will be advanced in the public interest.

The cultural environment in which space exploration takes place is complex and evolving. It is important for space agencies to understand their cultural environments and the interests of their publics (there is no monolithic "public" for space exploration but an array of many different "publics"). NASA and ESA exist in a social reality where special interests—political and economic and

Table 7

Current activities practiced or to be implemented in the near future to raise public awareness and engagement for space exploration.

Strategies	Tactics
Educational campaigns	Classroom: space technology education Textbooks including space program elements Teacher workshops targeting the space program Museums exhibits and field trips Educational TV/radio programs Educational journals Internships (high school) at space facilities Habitat training, astronaut training courses
Enhanced public outreach and media campaigns	Media events for space launches Television commercials with celebrities Science fairs, park displays Press conferences and press releases Press kits for reporters Video clips for TV news Planetarium shows Townhall meetings with astronauts Engage celebrities and popularizers Membership cards, gifts, toys, posters, pins Space camps
Engage in new media	Interactive tools to engage young adults Blogging, texting, podcasts Webcams remote views from missions Webchats Access to robots via internet Virtual games for the construction of space infrastructure Interactive exploration of new habitats Develop computer games
Monitor public awareness and brand value	Regular surveys of generation and gender specific awareness Re-evaluate image and brand resonance

business interests—will continue to ensure, for better or worse, the continuation of space programs. Consider this sociological perspective on a possible human future in space: “The impressive technologies developed for exploring and understanding the universe do not have to be used by the powerful to further strengthen their economic, military, and cultural authority. Public engagement should not focus only on engineering and hard sciences. This goal is well documented in the Vienna Vision that discusses how space activities worldwide are now entering an era where the contribution of the humanities is crucial besides political, industrial and scientific considerations to nurture public constituencies for long-term space exploration [11]. “Humanizing the cosmos could be a means by which humanity enhances itself through the acquisition of new knowledge...to understand the cosmos, its evolution, and our place within it” [33].

4. Conclusions

Space exploration, including human spaceflight, is an emblematic endeavor and has become an element of the political agenda of a growing number of countries worldwide, and particularly in the United States and in Europe. Currently, society is largely unaware of space exploration activities. In this paper, a SWOT analysis has been performed to investigate the internal and external

environments that influence public space awareness in the United States and in Europe. Dedicated market research and social and cultural studies taking into account demographic and other factors, are needed to determine how to effectively engage citizens in the United States and Europe in long-term space exploration plans. These studies must be broader and deeper in reach and better interpreted than in the past to be useful in efforts to inform and educate the public in new participatory ways. A brand analysis showed that NASA is an eroding brand that needs new brand elements and ESA has not reached its potential in brand equity. Both agencies have in particular to reach out to the young generation (generation Y and younger) using new methods of communication and interactive tools. We summarize that it is important not to equate public awareness, public understanding, public opinion, and public support. They are each different phenomena. Therefore we propose to promote a new participatory approach to actively engage the public stakeholder in space exploration, as an alternative to “winning hearts and minds”. The public stakeholder must be an integral stakeholder in the national (and later international) context of space exploration along governments, commercial entities and the science and engineering community. Consultation, collaboration and finding consensus with the societal stakeholder may provide sufficient resources and guarantee sustainability of a long-term space exploration program and foster aspirations for exploring the unknown.

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