

Digital Information Appliances

デジタル情報家電

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Abstract

Product segmentation using Performance and Versatility will be presented to identify the solution space for Digital Information Appliances, DIA. Optimized product Performance with high Versatility will be shown to define the DIA product space. Key technology and market elements will be discussed to explain the characteristics of a successful DIA product.

まず、デジタル情報家電(DIA)の目指すべき方向を示すため、商品の持つ処理能力と、対応できる処理の多様性の2点から、商品の分類を行う。高い多様性と、最適化によって小さく抑えた処理能力を持つ商品の分野が示され、デジタル情報家電の分野が定義される。さらに、成功するデジタル情報家電の特徴を説明するために、開発のための要素技術、商売として成功するための要素について論じ、成功するデジタル情報家電の特徴を説明する。

Introduction

The evolution of the consumer electronics product has been significantly impacted by the emergence of the Personal Computer, PC. The expansion and transition of the PC from a basic computation and word processing device to an entertainment and communications device has driven the consumer demand for unbridled increasing performance. The PC has established itself as the single most capable and versatile electronic device in the history of the world. The consumer enjoys the constant emergence of new activities made possible by the PC through advanced hardware, new software programs and an increased availability of information outside the home provided by its robust connectivity.

However, even with its versatility and incredible

capability, the PC is not the best solution nor the best substitute for all the consumer electronic needs. It is the PC's versatility that results in the PC being too complicated, too large and too generalized to satisfy focused consumer electronics problems. The telephone, TV and CD player are examples of less versatile and less capable devices that are still the more desired and valued solution for certain consumer demands.

The PC has enabled the growth of new infrastructures of information and services. This infrastructure was possible due to the significant proliferation of PCs able to adapt to the new offerings and create an entirely new consumer activity and capability. With the infrastructure in place, it is now possible to exploit those activities most desired by the consumer and develop them into focused and high value Digital Information Appliance products.

Market and technical dynamics also play a critical role in completing a full understanding of DIA requirements. Due to the volatility of the digital electronics industry, (despite standards), future products must be able to adapt with upgrades to variations of the content, the emergence of new applications and changes in the user's desires [1].

In summary, the Digital Information Appliance will emerge from two forces: the evolution of the current non-flexible and modest capability products into those of greater flexibility and connectivity and [2] the creation of focused use appliances, derived from desired PC applications, while maintaining or even improving the connectivity. The ongoing creation of robust Digital Information Appliances will define the new product and service growth opportunities in the consumer electronics business.

1. Product Performance and Versatility

The two critical dimensions or factors in the understanding of the DIA and in the defining of their solution space are performance and versatility. Fig. 1

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shows the relative positioning of some current consumer electronic products with respect to performance and versatility. It is important to realize that products will continue to exist and flourish in all four quadrants of the Performance vs. Versatility product space. The important observation is to realize an entire quadrant of the consumer electronics offering is emerging and is now available to be exploited with innovation and creativity.

Few products will ever rival the versatility and performance of the PC. The essential differentiating characteristic of a successful DIA is that the product is versatile within the smaller range of consumer expected capabilities, assuring the long usable life of the product.

↑ P e r f o r m a n c e	Quadrant I	Quadrant II
	DTV Digital Audio Internet Viewcam DTV STB Zaurus	Personal Computer
	Quadrant III	Quadrant IV (DIA)
	Viewcam Calculators VCRs Cordless phone CD Player Television	Dreamcast PVR Palm Pilot Digital STB
	Low Versatility	High Versatility

Fig. 1 Product positioning.

2. Product Creation in Quadrant IV (DIA)

It is necessary to accelerate the creation of product in Quadrant IV. These products fall into the category of DIA. DIA is a product category with significant future growth potential. The DIA products require a different product development process and strategy to maximize their probability of technical and business success. The two key characteristics that differentiate the DIA from other products are the optimized performance value and the high level of versatility.

3. DIA Product Versatility

Versatility is a key characteristic for the DIA because of the dynamic nature and evolution of available information

and content. The DIA must launch with a highly desired level of performance but must also be versatile enough to adapt to new applications and information over the expected life of the product. The DIA can not be a point solution in either hardware or software.

3.1 DIA Software Versatility

Software for the operation of the DIA must be designed to allow for regular unnoticed upgrades. The inevitable required patch or upgrade to meet the proper or desired modified operation must be designed as an integral part of the software architecture versatility. The second aspect of software versatility is the required capability of the DIA to receive new applications developed after sale of the DIA. These after-sale-applications, ASAs, are an essential element of the DIA software strategy. The DIA, through robust connectivity, will benefit from the available information but the DIA must also be able to add these new software applications, driven by information and services. The ASA will provide a two-fold advantage. First, the product manufacturer has the opportunity to sell software for their product to increase its appeal to the consumer. Historically application software for products has been a very profitable business. Second, by designing the software architecture to be an open platform with access for third party developers, the manufacturer can license development on the platform. This license arrangement will provide the consumer the availability of new software and functionality, it will provide the third party developers an incentive to create software and it will provide the manufacturer a share in the profits on sale of software. Therefore, software versatility will be accomplished through seamless software upgrades and the availability of new and unique desired consumer applications through an open platform architecture [3].

3.2 DIA Hardware Versatility

The DIA must provide for hardware upgrades by the consumer. Consumer products should never expect the consumer to modify the internal hardware. PC hardware upgrades that require internal hardware modification are not reasonable to the consumer. However hardware upgrades are necessary. The PC solution is a hardware upgrade through a robust interface like USB. USB allows even the most novice PC user to easily add printers, TV receivers, displays and even video cameras. The DIA must also have a yet to be defined robust interface connection

that allows future hardware to be added to the DIA. While the development of a new interface may be required, assessment of existing standard interfaces must be considered to leverage available resources. The interface on the Palm Pilot meets no industry standard but is sufficiently robust to support After-Sale-Hardware, ASH, like, IR blasters, bar code readers, LED monitors and power adapters. ASH can be provided by the original DIA manufacturer or by third party developers, licensed to provide solutions to the consumer for the particular DIA.

4. Revenue and Business in Quadrant IV

The key to the success of a DIA is the creation of a sustainable and profitable business, not the creation of technically superior products. The contrast of the potential revenue opportunities and business model requirement for each of the four quadrants must be considered to form a successful DIA. The DIA business can only be realized if the necessary aspects of versatility and performance are achieved. With this achievement, high use rates, which increase consumer demand for the DIA can be expected.

4.1 Revenue

Considerations of the DIA product can be better understood by revenue differences of products in each of the quadrants. Low versatility products offer sales without a tight tie to future revenue or profit from the consumer.

The lower versatility and lower performance products tend to be one-time sale products. The consumer purchases the product for a particular need and as long as the consumer's need is satisfied, the product will be desired.

The higher performance and lower versatility products tend to be specialized to meet a well-defined and well-behaved consumer need. While the consumer may spend more money for the added performance, the value is understood. These products can also offer services as an added revenue stream. The higher performance and higher versatility product like the PC offers many opportunities for HW, SW and service revenue. The extent of high versatility in an open architecture allows for many third party developers to work to add value to the product. The product space typically supports almost any desired connectivity.

Quadrant IV is the DIA. The design of the DIA can provide for the creation of similar revenue opportunities as seen with the PC. While the DIA performance objective is not to compete with the PC on every front, the performance in the focused solution space will often be more desired than that of the PC. The DIA excels in its connectivity for the desired function both to the network as well as to peripheral hardware. In addition, service revenue is enabled through carefully constructed connectivity to content, information, storage and communication networks to provide the consumer with simple and failure free operation. The revenue of the DIA will grow over time due to the increased installed base, requiring new hardware and software as well as the increase in the availability of desired services [4].

4.2 Business Approach

The DIA business plan requires the creation of a longer-term strategy. Since no standard exists for the DIA hardware or software or connectivity, the manufacturer must decide on specifications and implementations with a long life. Only with this long life will the revenue plan be maximized. In addition, a strategy is an essential element in motivating the development of hardware and software by third-party developers. The plan must be clearly understood by everyone in the DIA business, including the consumer. The business advantage of the revenue of hardware and software after sale of the DIA coupled with the service is illustrated in Fig. 3.

The very nature of the DIA business leveraging on widely available information and services will lead to significant competition. It will be difficult to maintain a barrier to new competitors after the consumer desires are realized. While this challenge may seem undesired at first, in any high growth market it is essential that others enter the market to create broad consumer demand. It is essential

↑ P e r f o r m a n c e	Quadrant I Product Sale Services	Quadrant II Product Sale Peripheral Sale Software Sale SW Upgrades Sale HW Upgrades Sale Services
	Quadrant III Product Sale	Quadrant IV (DIA) Product Sale Peripheral Sale SW Sale SW Upgrade Sale HW Upgrade Sale Services
	Low Versatility	High Versatility

Fig. 2 Revenue characteristics and differentiation.

that each manufacturer focus on providing the aspects of the business that they can do most profitably. And finally it is essential that the content and information become more available making the DIA category more desirable [4].

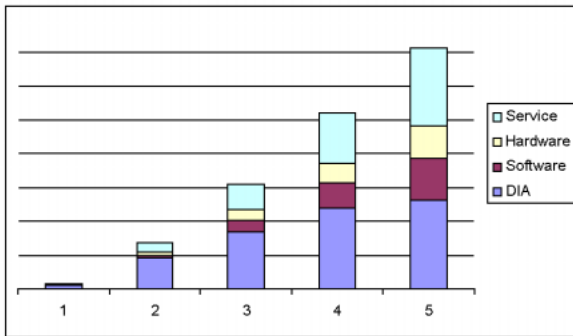


Fig. 3 Relative DIA business revenue sources.

In addition, the unique and advantaged technologies currently available to the manufacturer can be used to differentiate the product to the consumer. Many of the technology advantages will transfer from current products to help create an advantaged DIA. Since each manufacturer will have flexibility to define their particular offering, there is no reason to believe that current technical competitive advantages will not be maintained. The DIA will require an expanded capability of technology and product planning to assure market, technical and business success. Therefore it is necessary for the manufacturer to form those business collaborations that make all the necessary elements available for the product development.

4.3 Expanded and New Business Approach

Participating in the DIA business offers the opportunity for the manufacturer to form expanded business collaborations for increased revenue and profit. With the DIA as the delivery and interface appliance for the consumer, tight relationships with information, content or entertainment suppliers may be created to form a more competitive business offering. This collaboration allows for better product planning. The specific DIA product can then be developed to take best advantage of the services and content available. For connected information the business may include advertising, ecommerce and lead generation revenue. For the streaming content provider the business may include collaboration on the development of

the hardware to assure a particular service, or feature, can be enjoyed by the user. For companies interested in non related ecommerce, the DIA can be designed to navigate easily through the information to quickly and securely perform a transaction.

4.4 Potential Business Evolution

Development of a DIA used to deliver information, entertainment and services to the user provides a new dimension to the consumer electronic business. While ecommerce is one of the potential applications contained by a DIA, using the DIA to buy the content for the DIA forms a tight connection between the product and the service. Relationships with content providers for building both the delivery as well as the procurement device for purchased content could expand the product value significantly. Exploration of relationships taking advantage of this business evolution is available to the DIA provider.

5. Positioning for DIA Opportunities

The emergence of the DIA category has occurred as a natural maturation of increases in user connectivity, available information, the desire for electronic transactions and an insatiable consumer appetite for entertainment. The DIA category offers real opportunities in technology.

All DIAs require a display to deliver the information to the consumer. In some cases interfacing to an existing TV or monitor device may satisfy the display. However, in many cases, the best display will be the LCD. The advantages of power, portability and performance make the LCD a superb solution to the DIA manufacturer. Realizing that a DIA will not necessarily require the highest resolution or the largest LCD, manufacturers should be able to actively form both DIA products as well as DIA relationships that provide a market for existing display capabilities as well as set the requirements for future DIA display needs.

The Consumer Electronics manufacturers also have been developing capabilities in interconnecting appliances through HAVi. This early work in HAVi coupled with a working relationship with other HAVi members will provide a physical layer to consider for the interconnection foundation. In addition, the HAVi effort has provided Consumer Electronics manufacturers with significant insight toward the development of other interface approaches should they be necessary.

Communications efforts in the home 5GHz wireless techniques, should they prove robust and successful, may enable new concept product for information exchange. The key issues of communication, while satisfied typically through wired connections must also include wireless interfaces. A robust wireless approach, especially in the consumer home environment, can increase the functionality and appeal of future DIAs.

Early efforts in MPEG7 may lay the foundation to provide clear DIA product differentiation as adoption of the standard (still in development) occurs. The DIA must have the capability to provide the consumer with the information or the entertainment that is desired. With all the connectivity and all the available data, the consumer may get lost in a sea of data. The applications of MPEG7 with the incorporation of description schemes and meta-data will offer the potential of appliances that can quickly give a consumer what they want. This capability will rely on intuitive consumer inputs being leveraged by a robust data management approach.

The technology and research efforts any one Consumer Electronics company do not cover all the needed technology initiatives to be a leader in the exploitation of the emerging DIA opportunity, but planning can provide a rich foundation to begin a strong product initiative in the DIA category.

6. DIA Direction

First, handheld DIA with the integration of display, users interface, communication and connection technology. The specific functionality of this initial DIA must be determined through careful market and customer

assessments depending upon the desired launch schedule and the customer focus. A careful inclusion of the properties of the DIA defined early will assure a product meeting the fundamental DIA goals.

The second area of focus is in the STB. Again, the STB will leverage much current market strength. The growing market for Personal Video Recorders, PRVs, provides for a product solution space with years of DIA opportunity.

Conclusion

DIA is a growing product category in the consumer electronics business. The emergence of products has already begun. It is time to develop a strong DIA strategy for the Consumer Electronics manufacturers. Many of the key technologies to be successful for DIA already exist. Business relations necessary to succeed in the DIA product category must be established. DIA, a natural consumer electronic product category, grown from the PC and dedicated appliance products will offer decades of new profitable product opportunities.

References

- [1] D. Tapscott, *Digital Economy*, McGraw-Hill, 1996, ISBN 0-07-062200-0.
- [2] N. Postman, *Technopoly*, Alfred A. Knopf, Inc, 1992, ISBN 0-394-58272-1.
- [3] D. G. Rauscher, *The Broadcaster's Guide to the Internet and the World Wide Web*, NAB Research and Planning Department, 1996, ISBN 0-89324-250-0
- [4] J. Bernoff, et. al. , 1999 Forrester Research (various), Forrester Publishing, Cambridge, MA.

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