SOFTWARE as an export product from developing countries: Are there any real chances?

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1 Introduction

The world is divided today into two large blocks: those countries who have the latest technologies or have access to them; and those who have not. Exports from the first block are increasing; from the second, are either stable or decreasing. The main comparative advantages of developing countries: cheap labour, natural resources and available spaces and lands [2] are becoming less and less important as the new industries are automated and require less labour, as new materials are developed, and as biotechnology starts to enable production in very short spaces. It is a question of economic survival, and also a question of raising the quality of internal labour positions, that any country be planning what will be its high-technology exports in the years to come [3].

Software is a lesser known product than hardware in the informatics market, albeit being as or perhaps even more important than the latter. The overall market is very large, but in its infancy still in the developing world. Although some individual efforts have already taken place, like the establishment of the International Institute for Software Technology [5] in Macau, within the realm of the United Nations University, overall awareness in the developing world to the importance of software in the world economy today is still very low.

There are some solid and some conjectural reasons that justify the choice of software as a viable export for these countries. The topic is discussed in this article identifying opportunities and difficulties for the establishment of a national and internationally active software industry in developing countries, together with the specific actions to be taken in order to make it happen.

The following sections bring an overview of the full paper that is in preparation.

Section 2 presents some data about the international market for software and its main characteristics. In the following section, the comparative advantages and disadvantages of the developing countries to enter the market are outlined. Section 4 describes actions to be taken in order to establish the industry in the light of the Brazilian experience which might be clicked in other countries. Finally, section 5 concludes the article and presents some comments of a more personal tone referring to the subject.

2 Market

The informatics industry as a whole is already today one of three largest in the world, competing directly with the automotive industry and the tourism industry (not to mention prostitution and drugs, large industries about which there are no trustworthy figures...). The annual rate of increase of the informatics industry though is larger than the other two which will soon transform it into the largest industry in the world!

Software, within the informatics industry has only recently started being accounted for separately. Estimates vary widely both in absolute terms and in the annual rates of increase. It is difficult to have precise figures about the international market for software because there are different interpretations of what is a software product. There is off-the shelf software that is purchased in stores, there is software that is contracted outside a company for specific purposes, there is software that is bundled with hardware, there is software that is developed internally, etc.

Depending upon the classification, it is possible to say that the software industry sells between US$100 and 200 billion a year and grows at a rate between 12 and 30% [4]. These figures do not

take into account software that is developed internally to the companies and not properly accounted for, which is estimated at $250 billion a year, doubling until 1995! [6]

The international market for software as a product is split amongst a very large number of companies of small to medium size. The number of software companies in the US, for instance, is one order of magnitude bigger than that for hardware. The market is generally dominated by US companies, to the order of 60% [4].

The international demand for new software professionals is increasing at such a pace that extrapolations of the present trend towards the year 2000 indicate that all the population of the US, Germany and Japan will be writing software by the end of the century! The way out of such an absurd is clearly a dramatic change in the ways, methods and tools with which software is produced today and, more important to this discussion here, also the entrance of new players in the field of software production.

In summary, the market is very very large. The developed world cannot and will not meet the demand alone. Opportunities are there for new players within the conditions set out in the following sections.

3 Comparative advantages and disadvantages

There are several reasons why developing countries might have a chance in the software market. In the sections that follow a short list of the main reasons is presented.

3.1 Talent

Only a very small percentage of children that enter the educational system in developing countries reach university. Of those who do manage to get there, there is a concentration of talent in the technological areas like engineering and computer science. The reason for this is that these professions carry a high social value in the developing world, much larger than what it gets in the developed world. A worried English father would probably want his brightest son to go to Oxford or Cambridge and then become a civil servant. In the US it would be Harvard (law or perhaps an MBA) and then become a successful lawyer. In our countries it would be a good University (in Brazil, a Federal University or one of the state universities in the state of São Paulo) in an area like engineering, and then become an employee of a large company...

This is to say that the students who attend our best universities in engineering or computer science are of a very good level, even internationally. It is well known that students from the developing world who go abroad for postgraduate studies in these fields do very well in general. Unfortunately some of these do so well that decide to stay on for productive work so badly needed in their home countries, most cases for lack of opportunities back home.

So, talent is available, perhaps not in quantity, but at least in quality.

3.2 Creativity

A good software piece, to work properly, must do what it is supposed to do. That is obvious. But it should do nothing else, and that is not so obvious. To write a good software, the developer must have what is sometimes called lateral thinking: you got to be able to think of all the

unforeseen situations that might occur! In other words, it is important to foresee all the exceptions.

Now, who is capable of thinking about exceptions? Those who are used to it. Who is? Us, for example in Brazil, and that is probably true of many other developing countries. There is a saying in Brazil that goes: "in our country, exception is the rule!".

A good example of this is the report from a bank employee in Brazil describing the misery he went through trying to explain to an international consultant that the brazilian currency in a software program had to be a variable, since it had changed three times in five years!!!

The point here is that surviving decently in many countries involves a lot of creativity: over many decades this has become a trace of local culture that shows itself in many cultural manifestations like music, romance, plays, films, etc., and that could now become very useful in the software market.

3.3 Small investment

Producing software is not cheap! The days of the big software hit produced in a garage using an unreliable 8-bit microcomputer are gone! Professional software is produced today in modern installations, by well organised companies (though small, in general), using networks of high-speed workstations and substantial amounts of software tools.

There is a substantial investment then. What must be emphasised here is that this investment is very small in comparison to what is needed for the production of any other high-technology product. Take, for instance, micro-electronics or chemistry or new materials: the levels of investment to become a player in these fields are huge! Not so for software.

3.4 Production technology

The technology for the production of software is well known and understood: methods, tools, infrastructure, human resources, etc. A company in the developing world can design and implement an infrastructure very much like the one existing at for instance Microsoft in the US with no big problem.

The production technology is therefore non-proprietary in this case which makes it much easier for new players to come into the field.

Another favourable aspect of this item is that "sourcing" is not a problem. If one wants to produce microcomputers, for instance, sourcing for hard-disks, microchips, CRT's, etc., is a major concern. Again, not so for software. Components, if needed, can be bought in the market and transported very cheaply to the "assembly plant".

3.5 Entrepreuneurial interest

In many developing countries a large community of entrepreneurs and businesspeople has grown over the years when the economic model was that of import substitution. As these countries try to follow the international trend towards a more global economy, this sector of the society is eagerly looking for alternatives to their main core business.

This interest can be tapped, with appropriate incentives, for the software sector, since informatics in general is seen as a lucrative sector and has received a lot of media coverage in recent years (in fact in many places owning a microcomputer became much of a status symbol, even if the machine is being used just for very trivial tasks in the office).

3.6 Legislation

Although this question is very different from country to country, it is fair to say that legislation referring to the concession of incentives and special conditions for one particular sector of the economy is easier to get through the whole process of approval. That might be very important for the establishment or the strengthening of the software industry in any country.

There are of course many obstacles to be overcome. Some of them are presented here.

3.7 Specification

It is very difficult to know what the market wants or needs being away from that market. This is probably the biggest obstacle to the export initiative of any product, even more so in this case of specialised products.

One possible way out of this is to get the specifications from a company in the market (an international company) and get the revenues just for the development of the software product (coding). It is not ideal, since most of the revenues will be outside but still it is an entry point [1]. India is taking that road with a very active software industry.

Another initiative would be to buy the way into the market, either buying companies in the developed world or establishing joint-ventures with them for the development and marketing of software products. This is not easy though, and the subject must be very well understood, studied and debated to reach meaningful conclusions.

3.8 Trade mark

It is very common in the developed world to see people buying products by their brand name or make, regardless of where, how or when it was produced. Such is the case in the car industry, for instance. I asked several Canadians and Americans if they new that the car named "FOX" that they bought and used was actually produced in Brazil, and none of them new it. For them it was a Volkswagen car. The place where it was actually produced was irrelevant.

That is the power of the trade mark name. In order to be successful in the export market, a country would need one or a few brand names that were familiar to the public. That costs a lot of money to build and maintain but is a problem that cannot be overlooked.

3.9 Indigenous problems

Being in the developing world, with all the problems related to infrastructure, political organisation, unstable governments, etc., a company will be faced with serious problems to establish itself in the international arena.

Quality is a fundamental characteristic in the software business and that culture must be enforced in the industry. There is no other way. If the effort to establish a trade-mark referred to above is not paralleled by an effort to improve quality of products, in a general sense, the first effort will be useless.

Another big problem is that a major effort in any industry will need definitive and articulate government approval and support. The governments of developing worlds in general lack credibility and might jeopardise any serious effort. In some countries the government involvement might even become the "kiss of death": if they are in, it is not worth the effort and energy...

Lack of communications infrastructure and of access to information are other two major problems. Both have to be dealt with and resolved before anything serious can take place.

4 What to do?

Here the problem has to be individually addressed since solutions will differ from country to country. Some aspects of the problem can be considered general though, in the sense that every country will have to face them:

A. Planning

i. Studies – What is the international market, opportunities, niche markets, specific demands, channels of distribution, etc. Situation in the country: existing companies, potential for export, existing products, geographical distribution, etc.

ii. Short-term planning – What to do to convince the society that a plan is under way and it is for real. Funding for the initial steps in the plan. Establishment of national goals to be pursued, etc.

iii. Coordination of efforts – Definition of actors and rôles and what is expected of them in the national plan. Coordination of these efforts towards the common objective.

iv. General plan – Establishment of definite objectives, goals and means to achieve them with a 10 year horizon, stating clearly the responsibilities for each step of the plan.

B. The model company

i. The business – Business plan for the company. Demand, production, delivery, revenues, financial resources, location, trade-mark, investment, return on investment, etc.

ii. Infrastructure – Hardware and software needs. Networking. Communications, internal and external. Plant, specific building needs, working environment.

iii. Human resources – Number of people. Qualifications. Training.

iv. Funding – Special schemes for the star-up company. Government funding, venture capital, own investment, incentives for spin-offs from large companies, etc.

C. The technopolis

i. Existing sites: Places (towns, regions) in the country where there is already some effort under way to establish a concentration of high-tech industries.

ii. Software technopolis : Prerequisites for participation in the plan, choices of initial places.

iii. Pilot experience : For each chosen site, infrastructure, coordination with local governments, incentives, follow-up and conclusion

5 Conclusion

The world of the future will be dominated by the countries who detain or have access to the latest technologies. This brings several concerns for developing countries. Discussions on the subject are lengthy and endless. I would like to concentrate on one aspect of the problem: that of quality of labour.

High-technology labour posts are in general clean (not always safe though), climatized, with the latest and more comfortable furniture, in well-developed regions of a country, close to the best educational institutions, and, most important, well paid. The reader might have noticed that I did not mention in the advantages of the developing countries for the production of software the fact that programmer's salaries are one or two orders of magnitude lower. And that was not a lapse: this industry should be established in our countries to raise the standards of labour and living of our citizens *including getting paid on an international level.* At first the lower salaries will be an advantage, of course. But the industry should not be created based upon this assumption. It should be competitive because of the other advantages listed in section 3 and even more so at the beginning because of the lower salaries.

Another opportunity that was not mentioned previously is that we should look for niche markets as is sometimes recommended by specialists. I believe that we should indeed look at niche markets as one segment of the general market. But we should look at the mainstream markets as well and think big: no inferiority complex should blur our vision and diminish the scope of the programmes.

I sincerely believe that the chance is there for the taking. Brazil is going ahead with such a programme [7] and is willing to share its initial studies with everyone. This article is just an overview of the subject and I welcome any comments, questions or requests for information that the interested reader might want to address me. I would like to acknowledge fruitful discussions with and contributions from A. Salles, F. Souza, C. Violato, C. Mammana, V. Almeida, T. Takahashi, I. Campos, S. Meira, A. Moura, C. Lucena, E. Araújo, G. Lucena and J. Portugal, who helped me stay firm on the ground when enthusiasm pushed me too far out on expectations...

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