
1 A typical food R&D organization: Personal observations

I know that our R&D probably costs twice of what it could cost but I don't know which half to cut.

Helmut Maucher

1.1 INTRODUCTION

Let us play a game. I like playing games. Research and Development is typically abbreviated to “R&D,” and that’s good, because otherwise books, publications, presentations, discussions, and such would become too long, always repeating “Research and Development” instead of using the short, catchy, and dynamic sounding “R&D.” The game is easy: find as many other meanings for R&D as you possibly can and list your favorite ones. Let me give you a few examples: rich and dumb, raw and delicious, real and daunting, rooster and duck, ready and done, ruined and defunct, researched and developed. Oops! The last one is almost the same as research and development, however, there is an important difference: research and development means that everything—or almost everything—is still ahead of you, while researched and developed means: done, ticked off, executed, found, and made. I can tell you from deep and longstanding personal experience that the past tense R&D (the “Red & Ded”) is the real dream of every company executive in just about any company in any area that you can imagine, while the “R&D” is a real headache for them.

Figure 1.1 illustrates our “find-other-meanings-for-R&D” game.

This book is mostly about this headache and how to heal it. It’s not about “pills” that can help the headache go away but rather a change of lifestyle, or more correctly a new approach to R&D, especially in the food industry so that the headache goes away by “natural” means or doesn’t even come up in the first place. This is not an easy feat, yet it is worthwhile, no, essential to undertake, otherwise R&D in the food industry will cease to exist because in case of doubt which half to cut, CEOs and executives of the food industry will simply cut it entirely, partly out of frustration and partly out of simply not knowing better. Members of the business and commercial community and even those of the manufacturing and procurement community

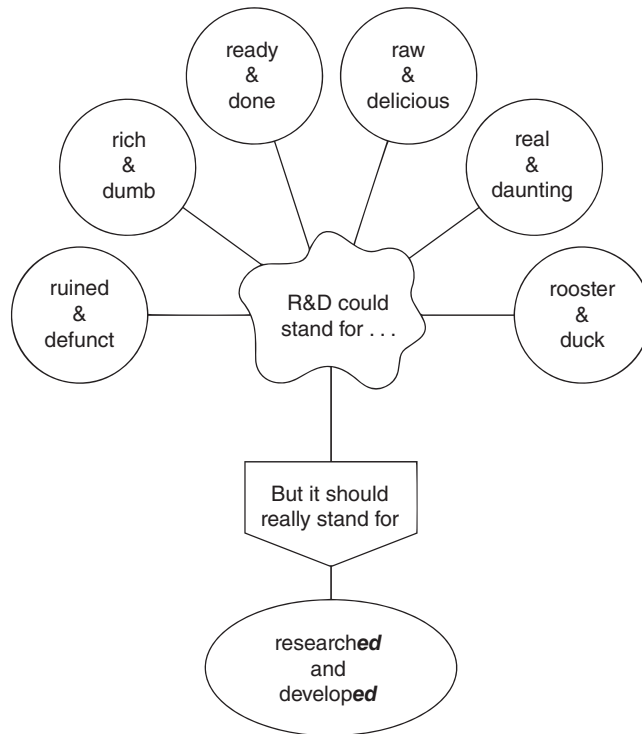


Figure 1.1 R&D could stand for ...

seem to have little understanding for anything that is R&D “tainted” and a bit more basic and difficult to understand. This is unfortunate but it’s a reality, which cannot be neglected easily or even discussed away. Chapter 10 will in much detail discuss the scenario of an R&D-centric food industry organization in which scientists and engineers “call the shots” and hold the reins of the company. I can already hear business and commercial leaders shout out in unmistakable ways what they think of such a scenario. Their discontent will even be bigger when the following hypothesis will be discussed and analyzed.

1.1.1 Business people always know better

Commercial experts mostly know all about their field of action and because science is not easy to understand, let alone being learned in evening school, they don’t even attempt to understand scientific and technical or engineering details. On the other hand, there are oodles of scientists and engineers who have ventured out to get an MBA degree in addition to their technical degree. What I want to say here is simply that scientists can fairly easily acquire expertise in business, whereas commercial and business people hardly ever, or better *never* go back to college and do a science degree; it’s simply too time consuming and not an easy undertaking. At least that’s true for the food industry. The situation is different in the pharmaceutical and

even chemical industry. And it's even more so true for the finance and banking industry, although it is difficult to assume that scientists could have come up with a bigger mess than the good people in banks and the world of finance in recent years.

But let's get back to our topic. Not to let scientists and engineers get ideas that they could rise in the hierarchy, they have to be put within their boundaries and not get the idea that they could become CEO of a company. Best shot is CTO and that's that. However, the hard-to-dispute reality is that it is possible for a scientist or engineer to acquire a business degree, but it's virtually impossible and almost unheard of that business leaders acquire a science degree. There are of course exceptions to this and, again, especially the pharmaceutical industry has many examples in which medical doctors or scientists have become CEO.

Well, after this initial rant, which sets the tone of the book, quite on purpose, let's get to business and talk about R&D in the food industry, what it is, what it might evolve to, and lastly, what it really could be.

1.2 A LOOK BACK IN WONDERMENT

Corporations always had R&D departments or functions or labs or just a few "crazy" guys inventing something. The strange—or maybe not so strange—fact seems to be that most corporations in the past were founded based on a great idea and invention by a technical genius or guru who then, together with partners, mostly business savvy ones, turned this idea into some great business of sorts. History shows that most often the tech gurus who were the inventors and the real basis for the new company to exist in the first place and to grow were quickly put to the side and so-called business people, the serious guys, the guys who knew, took over. This pattern over so many years has been rather successful; rare are the exceptions that it is taken for granted today that corporations have to be led by business representatives and not the technical guys.

1.2.1 Innovation is everyone's business

This is not to say that all innovation and invention is of technical nature and only technical people can innovate; far from it. Technical innovation would not fly if it were not accompanied by business innovation. There are many important business innovations especially in logistic and supply chain, manufacturing, stock keeping, procurement, and purchasing, and even accounting and financing and new approaches to legal matters have come to pass. What I definitely do not count in this list is cost cutting. Cost cutting is probably the antithesis of progress, innovation, and sustainability. When highly paid managers don't know any further they either go "back to basics" or call for a "cost-cutting initiative" or worse, they do both. I emphasize this so much because at first sight this really is counterproductive to innovation and progress. On the other hand, restricting means and tools and making life a bit more difficult for everyone is, after all, not such a bad thing. Restriction and scarcity of available means can actually provoke and even sustain innovation. As for all things in life, the balance and especially timing are of the utmost importance to steer the ship of R&D smoothly and successfully.

My first venturing into corporate R&D dates many years back to the late 1970s and happened while I was working as assistant professor at the university in Vienna, Austria. The department in which I had worked on my thesis has had a long-standing contract with a U.S.-based pulp and paper company and was mainly interested in knowing all about lignin, this “nasty” side product that you get when you work wood, mainly pine wood, to paper and cardboard. Lignin is almost like gold in as much as it almost can’t be broken down into useful chemicals and so, in these days and to a high degree even today, went into asphalt or hair dyes as additive and similar, low-added value applications. The chemical structure of lignin, a “compound” of several aromatic (six carbon atoms) rings, would make it a highly valuable candidate for many applications if it could only be broken up in meaningful and cost-effective ways. Anyhow, the company wanted to really turn lignin into something valuable and had supported, financially and with a lot of patience, ongoing research in this area in our department for many years, however, without too many striking results to say it nicely.

1.2.2 Let’s go and have a drink

Management representatives of the company visited us twice a year and made the “sacrifice” to come to Vienna from somewhere in the Carolinas and meet with us, hear us out, encourage and criticize us, and mostly also to go out with us in the evening, preferably to one of the rather famous—or infamous—“Heurigen” restaurants where you drink the local wine and, if you would like to, bring your own food.

The wine is served in glasses of a quarter liter, so they are rather big; enthusiasm and the atmosphere easily carry you away to drink more than you actually can take, especially if you are not used to it. You can imagine that the mood soon became cheerful and everyone was happily complimenting everyone else for the good work, the great results, and so on. This was the first time in my professional career that I totally grasped the real meaning of “wining and dining” and especially its central importance in the corporate world.

The next day was always extremely tough and demanding. This was partly because the hangover that typically resulted partly from overindulgence (a euphemism) and partly from the tough questions that were asked during the meetings. We had to prepare reports and the running joke was that the company representatives would always expect results that were similar to “diluting water with water” and make everything even more cost efficient and ultimately cheap. In those days, writing reports meant typing them on typewriters and then duplicating them on “spirit duplicators.” We had photocopy machines, however, the costs of one copied page were still rather high, so we went to this cost-efficient and ultimately cheap device of duplicator, and I vividly remember having rolled out hundreds, if not thousands, of pages for such meetings. So, on top of having come to an intimate understanding of the term wining-and-dining, I also learned the true meaning of rolling out early on in my R&D career.

1.2.3 Never give up and continue to hope

Interestingly enough, these meetings in my recollection never turned “bloody,” messy, or unpleasant. We always came to good conclusions and expectations of even more promising and especially conclusive results next time. I was in charge of the research group for the better part

of 3 years but the group had already existed for more than 10 years when I took over. So, looking back, I have to assume that the results were always sufficiently promising that the company continued to ask for more work to be done and more discoveries to be made, as little and insignificant as they might have appeared. This was another important early learning what R&D and especially corporate R&D was, and still is, all about: Hope. “Sister Hope” is probably the foremost driving force in R&D, even when looking back (Note: hindsight is the only exact science!) one can see that the road of discovery is filled with cobblestones of misadventures, deceptions and disappointments. But wait, there is hope beyond Hope: “Never give up” is the younger brother of the first born sister “Hope” in the world of R&D. I have to admit that these two siblings are rather weak reasons for R&D to exist, would they not have another sister, the youngest and most volatile of them all: Success. Success is what everyone wants to see and have and strives for, but little sister Success is always somewhere else and rarely with you. You always have to find her in the most unexpected places and have to keep her away from bad company and bad substances. If you invite her properly and accept her wholeheartedly, she is more likely to visit you, but again, it’s not a guarantee. You have to work hard and use sister Hope and brother Never-Give-Up all the time to eventually meet Success. It’ll be a sweet meeting because it will give you the ultimate justification that sister and brother were all worthwhile and most important to have. It’s like with every other family: only the sticking together gets you through all difficulties and brings you to much deserved successes.

The family is of course not complete without parents like father “Finances” and mother “Business,” uncles “Procurement” and “Manufacturing,” and aunts “Legal” and “Marketing.” And there are many more relatives, more or less distant, that you can add to this incomplete list of family members, and they are all important. And this family has to have many friends, what do I say, oodles of friends, hundreds of thousands, better even, millions of friends that look in admiration to this great family and which we can loosely define as “Consumers.” This book focuses on the three siblings Hope, Never-Give-Up, and Success, in the deeper context of R&D and how these work together and give each other praise but also consolation whenever needed, especially if sister Hope has once again disappeared for quite some time.

1.3 A LOOK BACK TO THE BEGINNINGS OF A TYPICAL FOOD INDUSTRY R&D

I need to apologize to you the reader for the fact that I base my experience largely on my former company, but this is where I learned all about the typical food industry R&D organization. Given that this company is the biggest food company in the world, however, probably makes it representative enough to use it as a historic example. Moreover, throughout many years, and especially the years during which I was responsible for the open innovation program “Innovation Partnerships,” I came to meet many colleagues, especially R&D colleagues from a really great number of food and food-related companies, which gave me great insight into their R&D organizations. I will, therefore, always complement this look back with examples from many other companies, large ones and also smaller ones, the so-called “SMEs” (small and medium sized enterprises).

1.3.1 It all starts with a great idea

Speaking of my former employer, the Nestlé company, I would like to remind the reader that it all started with an idea, based on an apparent and urgent need, to create a healthy and stable product; healthy for malnourished babies and stable so that it would not get spoiled. Poverty levels during these times, the mid-nineteenth century led to the situation that many pregnant mothers were malnourished or simply undernourished, and breast feeding, although by far the best and most logical way of feeding a baby was often not possible or did not give the right nutrition hence the need for complementary nutrition. And stable it had to be because the notion of a cold chain was just not around in these days and fridges were, although invented, not yet in large usage. So what was more logical than to create a dry product, in this particular case, a dry, ambient temperature stable powder through drying of the liquid formulated milk mix.

Whether you like the example or not is beside the point, but it shows two essential elements coming together, which are at the heart of every successful business, be it food or anything else, namely: recognition of a need and the idea for a technical solution and ultimately realization. Recognition of need and deployment of a solution are an unbeatable combination and should be at the heart of any business. The deployment of the solution, however, comes only at the end of an oftentimes lengthy and cumbersome R&D process with many trials, errors, and failures. At the end of the day, every R&D process always shows many more failures than successes. From the beginnings of modern corporate R&D as we know it today, in the early and mid-1950s, and ever since, this has always been a true statement: there are many more failures than successes, out of 100 attempts maybe just a few make it to the end. I have discussed this in my book *Food Industry Innovation School: How to Drive Innovation through Complex Organizations* (Trautler 2015).

Business has become smarter, or so they think by streamlining the efforts, writing detailed briefs, setting milestones, and setting out bonuses for achieved results. Fundamentally this all appears to be quite OK, except that it might kill the surprising deviations and odd turns that any project may take. I shall discuss this serious topic in much detail throughout this book; suffice to say that, the jury is still out whether such an organized approach is really hitting home and bringing many successes.

1.3.2 People were frightened

Let me return to looking back again so that the context of what is happening today and what could or should happen tomorrow becomes clearer and more understandable and believable. The beginnings of modern corporate research of my former company date back to a time in the mid-1950s, a time, which I only got to know through the crazy stories, stories of crazy and daring characters and other outlandish stories of the pioneers. The precursors of these times actually date back to the years just before World War II, but as far as I can personally judge were performed in much different ways to the ones that really begun after that war. So I will rather focus on the latter and tell the stories of what I have personally experienced plus a bit of preceding “folklore.” These early years, like every other period of R&D, were influenced by societal concerns, which a few years later also found their way into the creation and findings of

the “Club of Rome,” for whatever they are worth (Meadows et al. 1972). These limits to growth were very much in the public discussion probably already 10 years before the Club of Rome findings and they helped to shape research directions and the resulting research projects.

The early 1960s were the heydays of the Hippie movement, which in rather straight terms left no doubt about what they wanted apart from the heavily publicized “sex, drugs, and rock ‘n’ roll”: back to nature, simpler lifestyle, and indirectly using fewer resources. The late 1960s brought an even stronger movement, widely known as the students’ “revolution” of May 1968. Many people to this day still believe that the “devil descended on earth” in those days and blame the movements of May 1968 for all evil on our planet, without a doubt. I’ll let you the reader draw your own conclusions on this debate, but nevertheless, the 1968 movement brought, probably for the first time, an air of sustainability thinking: deal more carefully with finite resources. The first big so called “oil shocks” of the early and mid-1970s were yet another stepping stone to make everyone who wanted to know aware that we are sitting on finite resources and we should, after all, better be a bit more careful.

1.3.3 Are we depleting our resources?

The mid-1960s were therefore heavily influenced by this feeling of finite resources, a growing world population, and the food industry would have a special and responsible role to play in this entire context. Fear of future food shortages was almost palpable and was subsequently directly reflected in the research programs of many food companies, especially how to solve these.

The first really big research program that I heard about in my former company was initiated during these years and had one simple definition and goal: use oil (the type that comes out of the ground by drilling) as one raw material to be fed to yeast and thereby create so called “single-cell-proteins.” Wow, what an idea. But hold the horses before you start ranting about the “absurdity of the idea” or anything similar. The entire idea was of course not totally new because researchers at British Petroleum (BP) had worked on the idea of feeding straight-chain hydrocarbon from their fractionation processes to yeast already as early as the mid-1950s; they called this the “proteins-from-oil-process.” The real difference to the older, well-established processes of growing yeast was that instead of sugar, n-paraffins were used. BP built a first small-scale pilot plant in 1963 (Bamberg 2000). The entire single-cell-protein process became rather popular in the 1970s and even won a UNESCO Science Prize in 1976.

It has to be understood through the reading glasses of that period and then it might become a little bit better to swallow. I don’t want to put today’s judgment on this idea, although this process probably uses a lot less water to make the equivalent of 1 kg of vegetable proteins, let alone the freakishly high amount of water required to produce 1 kg of animal protein. But that’s beside the point, and I don’t want to discuss the validity of the project so much but rather the organization in a large food company. Rather surprisingly, this project quickly became the *only* project of the company’s research organization during quite a number of years. This would be unheard of today. Maybe the last such “put all resources behind one goal” approach was NASA’s *Apollo* mission of the 1960s. This leads me to believe that these years were more daring and higher risk-tolerant when it came to putting all the eggs into one basket, so to speak. However, I am not saying that these were “the good old days” because they were not or at least very rarely.

1.3.4 Focus, focus, focus

The positive aspects to this approach are of course the great focus, the large number of resources that were put behind one goal, and the clear goals and timelines that were defined. On the other hand, serendipity was pretty much excluded, even if many NASA scientists still to this day pretend that the invention of a ball pen that could persistently write when held upward was a great outcome of value for the public. By the way, the Soviets used pencils for that purpose; rather foolproof, isn't it? Don't get me wrong: I don't want to belittle the *Apollo* missions of these years. I personally believe that the moon landing was the greatest thing that ever happened, even better than the Beatles. I was influenced so much or rather infected by this space virus that I started to work with the NASA "Mars guys" only a few years ago and have as much pleasure today as I had then. I do admit that quite some years have passed since these early moon years and the technology of today is not only much more sophisticated but because it is so versatile, it is really useful for all of us.

But here I am deviating to the present time and even future, so let me get back to "those days," the days of the appearance of corporate R&D, especially in the food industry. One of the real reasons why a project such as single-cell proteins could not only be initiated but also run over many years—in my recollection the better part of 10 years—is most often based on personalities and personal convictions, especially those of the leaders. While on the development side of projects in the Nestlé company in those years, coffee and to some degree dairy products, including infant formula, were pretty much the main areas of R&D; the more basic research part of R&D was really preoccupied with work on single-cell proteins and this all happened because there was strong leadership influence on both research as well as development. Almost like two warriors fighting for supremacy, these two leaders were fighting for what they believed was the most important thing to do for the company. Looking back, it can easily be seen that the single-cell protein work pretty much disappeared with the disappearance of the strong leader—and believer—while projects related to areas such as coffee, milk, and infant still live to this day and are of great importance to the company because they do reflect the product portfolio quite closely.

On the other hand, even in monolithic and controlled research environments as was the case with Nestlé in the mid-1960s and 1970s, strange things could happen, and almost under radar of the mainstream, other, smaller projects could blossom. One of these projects that was initiated in 1955 (!) actually survived several decades and is believed to still exist, 60 years later, somewhere in the underground of the research project portfolio. The fun part of this is that the "really important mainstream save-the-company project" did not make it, while the unimportant small and quirky project survived for 60 years. I am not saying that this is a good thing, but it is a reality that can be found in research environments in many food companies and beyond. All these activities had—already in those days—one important common denominator, and I have mentioned this a few times: they were all organized in project structures, pretty much the same way as you would see it today:

- Goal based on a need or needs
- Description of most likely pathways to reach this goal
- Selection of most-promising technologies and resources

- Definition of milestones and timelines
- Detailed description of the end point
- Definition of closure and post analysis

You can restructure and reformulate this typical project flow as you see fit, but basically most other flows will still look similar to this one and are more often differentiated by semantics rather than substance and content.

1.3.5 A historic perspective

Let me attempt to compact this historic view to the past and present, the view on the origins and evolution of modern-day corporate food R&D in a simple descriptive beginning with the era after World War II.

The period of post—WW II between 1945 and approximately 1965 could be characterized by the drive to develop new food sources to feed populations that have strongly reduced caloric intake during the war years, which partly explains the drive for finding new sources for proteins: oil seemed to be abundant, food needed to be created by either growing (the traditional ways) or synthesizing such as in the single-cell approach.

I would suggest that this phase was followed by the post—Club of Rome period, which probably lasted from 1970 to around 1985. This period was characterized by fear of scarcity of resources, leading governments but especially nongovernmental organizations (NGOs), and in turn the ordinary consumer to take on alarmist positions. This subsequently led the food industry to create, what I would call “catch-up” type of projects or in other words, opportunistic projects.

The next, partly overlapping period was the post—moon-landing period between roughly 1980 and 1995. This period saw a lot of “everything-is-possible” attitude and the industry started quite a few rather extravagant projects, such as low-calorie fats and similar ones.

During all these years, since the early 1970s, the information technology (IT) revolution took place and really took root as something here to stay in the mid-1990s. So this led to the next important period in this historic overview.

The post-IT-revolution period, which began approximately 1995 and is still ongoing. Individualism and individual consumer-related research and development was and still is the big driver and was clever in finding health and wellness-related topics leading to many new food product propositions, such as responding to lactose intolerance, reducing salt and sugar intake, and more recently gluten-free products. Some of these are fashions and come and go, others are likely here to stay.

1.3.6 Let's cut costs

I would add one more, also overlapping period to this historic review, namely the period of the efficiency and cost-cutting revolution. To satisfy the shareholders and financial analysts when it comes to the value of each company, and that includes food companies, repeated and ongoing cost-cutting exercises have become the rule in almost every company. While it should be

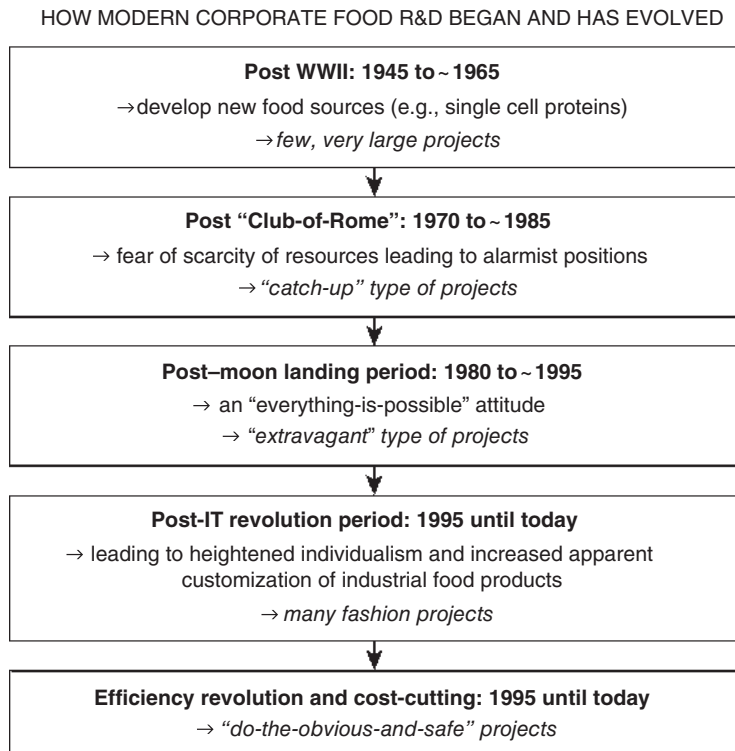


Figure 1.2 Historic view of evolution of today’s food industry and its R&D.

obvious that being careful when spending company resources should be the norm for R&D, there is a different tone to be heard when the next cost-cutting exercise is announced, including the more-or-less exact sum as to how much should be saved. Unfortunately, this approach or rather this attitude led to the situation that only the more obvious projects, those, which have a higher promise of success even with potentially low margins at the end, are projects that are generated and run. They were often created under slightly misleading financial prospects, just to get them off the ground in the first place.

Figure 1.2 gives an overview of this discussion and analysis.

1.3.7 Food industry has simple and tangible goals

The major goals of any food company, small or large, are always to produce safe, healthy, and affordable food. And yes, it should also taste well as perceived by the consumers. It is therefore rather obvious to expect that each research organization in the food industry—and this goes for just about every industry—follows their major needs; in the case of the food industry are answers to questions related to what hides behind “safe,” “healthy,” “affordable,” and “tasty.” It is as simple and as complicated as that, and my personal take on this is that because an organization that helps find the relevant answers is rather simple in its build, people often try to make it more complex.

1.4 FROM SINGLE AND LARGE TO MULTIPLE AND COMPLEX

As a consequence of the recognition of the four major research pillars (Safe, Healthy, Affordable, and Tasty), food companies started to organize their research organizations accordingly. Departments were created that grouped logical areas together. For instance an entity that grouped macronutrients such as lipids, carbohydrates, and proteins together was named “Food Science Department.” Quite logically, this department may also have comprised activities in areas of micronutrients, such as vitamins and minerals, antioxidants, and other relevant minor, active food components.

Because safety is one of the major concerns of the entire industry, an entity was founded that looked into food safety, not only from a toxicological but also from a procedural point of view: were technologies and processes in manufacturing safe and also leading to safe products?

Taste is of course the holy grail of every successful food and food product, therefore many important strides had and have to be made and work around taste and also texture and were centralized in a group typically called “Food Technology.” The names may differ from company to company, and it is clear that especially smaller food enterprises had to group some of these activities together; this also happened in the large corporations. Thus, food science and food technology often became one entity, which made sense in as much as all taste and texture is a combination of ingredients—macro and micro—as well as processing and technologies. Moreover, smart selection of ingredients and optimal processes would eventually also lead to lower costs, thereby to increased affordability for the consumers.

Well, there still is the “healthy” bit. In the food industry, ever since its creation in its present-day format, healthy products were always at the forefront of every new product development or improvement of existing products. At least that’s true for those companies I know and have worked with. The food industry has always looked out for help in the medical and pharmaceutical industry to find and apply metrics that could demonstrate certain health aspects of the industrially produced foods and beverages. Intuitively I would say that when George and Mildred Burr (1929, 1930) discovered, and for the first time described, the importance of essential fatty acids, we saw the onset of modern nutrition research.

1.4.1 Nutrition has growing pains

Of course there were many nutritional type studies in the years prior to these findings, however, never was there such causal proximity between a food ingredient and its function in the body described in that much detail. And it took almost 30 years until Ralph Holman and his coworkers picked up the ball and led many nutritional studies, metabolic studies to be exact, which demonstrated clearly this correlation between intake of certain food ingredients and their effect on the human body. It took the better part of another 15 to 20 years before the metabolic pathways of essential fatty acids, actually of fatty acids in general, were elucidated by the likes of Howard Sprecher (1981) and his colleagues at Ohio State University.

I use the example of essential fatty acids not only because it is fairly well documented historically but also because I have extensively worked in this area myself and have still quite a lot of affinity to this area of research (Trautler 1987).

It is clear that this is not the only example where food ingredients—macro as well as micro—meet nutritional science, and there was much work done on proteins as well as carbohydrates. However, I feel that there is greater linearity in the fatty acid research than in any other area. I can already hear protein and carbohydrate experts grind their teeth; forgive my bias toward the fatty acid arena and use this as an example of early days and still ongoing nutritional research.

In parallel to the activities of scientists and engineers in the areas of lipids, proteins, and carbohydrates, structures were built up in the food industry R&D over many years that deal with the same macronutrients from a nutritional angle. And then there are all the micronutrients such as vitamins, antioxidants, minerals, and a few others that over time were at the origin of more research groups dealing with all these additional food elements.

The next real important step was then taken once it was recognized that all these groups—food science, technology, safety, and nutrition—all required solid support systems in terms of basic understanding of pathways, interactions, and the determination and analysis of metabolic but also structural compounds. Basic science was needed, often defined by the term of *knowledge-building* or something similar.

When the company heavily worked on new coffee-roasting and extracting technologies, it was quickly seen that any process had to be accompanied by a deep understanding of the underlying chemistry, and hence the need to analyze volatile as well as nonvolatile components that had been formed, especially in the roasting process. This is just one example of the need for knowledge building to back up both, purely technical and also nutritional projects in the food industry's R&D organizations.

1.4.2 The new risk management approach: Many projects

The real message that I would like to get out here is this: in the beginning of R&D organizations we saw few, focused and fairly large projects, supported by the majority of the staff that worked in R&D and also largely supported by management who believed that this was the real way forward. The risk with this approach is rather obvious: when this one, all-encompassing project fails, there is not left to show to management and it is difficult to receive continuous funding for such an undertaking. It works in the beginning because one can always ask for more time and patience, and the results will come, after all. But when it so happens that the results never really materialize, and especially, when priorities change during a lengthy lifetime of a mega project, then you can imagine that this is the real killer and soon people would find themselves out of a job because they were experts for a specific area, not necessarily usable in a new, a different one. So, it was not at all surprising that over time, once the failure of the mega project was recognized and especially also “digested,” a company—any company—would change their approach and spread the risk more evenly over more if not many projects. The unfortunate result of this is that, because there may not necessarily be more money available to support more resources, the existing resources, as expert as they may be in the required new research fields, will be spread out fairly thinly across a large number of projects. This means that focus is lost, speed of execution may suffer, and promising directions may have to be abandoned and new outcomes may just have been lost.

Nevertheless, that's exactly what happened over the years, namely the migration from few, big-and-focused projects to multiple, smaller and less-supported projects. As probably always in life, the right answer would lie somewhere in the middle and really outstanding program and project portfolios in companies would take this middle-ground approach into account. Quite naturally, in my own experience, I saw the opposite happen; we went from few and big to not only multiple yet rather *many* projects over a period of 20 or so years. As an example, an organization of 100 scientists and engineers could have as many projects and sub-projects and tasks and such with the additional burden that those who ran a project, the project leaders, would not only work on their own project but also would have to contribute to projects of their colleagues; this could sometimes mean that a scientist worked 30 percent of his or her time on the own project, 20 percent on project 2, 20 percent on project 3, 20 percent on project 4, and 10 percent on project 5. And, because everyone in a high-performance organization—whatever that is and I will discuss this later in the book—is expected to work more than 100 percent might be found to contribute 10 percent to project 6 and, why not another 10 percent to project 7.

This, of course, is a rather ridiculous situation and you can imagine that the quality of the outcome of any given project is rather doubtful, let alone the timelines, which may have shifted ever so often. This was, and is clearly an undesirable situation but was the case in the transitional years of a food R&D as I knew and still know it. The names of the game are: flexibility, versatility, and good salesmanship of the results. And everyone played that game, and to some degree, still plays. Management as well as the scientists and engineers, they are all connected in this negative spiral of doing as much as possible with as little resources as one might just get away with.

1.4.3 Too many projects? No problem, reorganize

I have personally experienced this project expansion movement and, as a reaction to this, strong efforts to again reduce the number of projects. This is a tedious, time-consuming, and costly effort, and I will discuss this in much detail in Chapter 2. Let me just say this here: scientists and engineers are typically creative people and what typically is done when management requests a reduction in projects, the first reaction is to reorganize the portfolio without really giving up anything. Similar activities or work areas are all of a sudden grouped together and new “super projects” are created. The old projects are reclassified and are for instance called “tasks.” So, from initially 100 projects, the number might be reduced in almost no time to for instance 50 or even less but all of a sudden consisting of 100 tasks in total. This looks good on paper and may calm down management's excitement to have a more streamlined R&D organization and project portfolio but at the end of the day nothing has really changed.

Let me, however, introduce the following. There are two main reasons why an industry, and especially the food industry, work on many projects simultaneously. First, you cover much ground of potential relevance and importance and thereby spread the risk and secondly, scientists and engineers can better “hide behind” a large number of projects. One of the projects I am working on or participate in will hopefully eventually succeed, even if many of my other activities might just not. Chances of being associated with a winner are bigger.

However, the food industry is not alone in this and I could experience similar approaches in the chemical industry when I had a chance to work with some of the big ones in Germany. It is my assumption that the reasons for having a portfolio with a large number of projects are always the same as just mentioned in every R&D organization. Again, I shall discuss this in much detail in the following chapter and throughout the book.

1.5 WHY DOES THE FOOD INDUSTRY NEED R&D AFTER ALL?

For some, this may appear to almost be a blasphemous question, a question that cuts right to the heart of the matter, and which should maybe not even be asked, less even discussed. There is R&D, “always was there,” so why ask this question. It almost sounds like the question as to why we have marketing or why we have a moon.

1.5.1 Million dollar answers to the million dollar question

Well, one simple answer is of course: because they can. It is probably not a good answer but certainly a valid one. Another answer could be because from a tax point of view R&D activities can be seen as a cost, although they really are an investment, and therefore represent a nice tax-deductible chunk in the balance sheet.

Yet another answer could simply be because the origin of almost every company and especially a food company, as shrouded as it may be in the long distant past, was always linked to a tangible idea that came out of an R&D like brain, setup, group, or just a few people working together and concocting something of potential value for the consumer and thereby for the company as well.

And here is another reason: R&D activities always look good and their outcome can be measured (e.g., in the value and strength of intellectual property, that is, number of patents, product launches as a consequence of R&D activities, and similar considerations). These metrics can be used by the financial analysts and can have a positive impact when a company’s value is calculated with direct impact on its share value. Yet another reason for the existence of the R&D organization in a company might be to increase the company’s standing in the eyes of the consumers. Just imagine a food company that sells their products without any credible and reasonable R&D activities behind these products. Another reason could simply be that management believes that a good and successful R&D shines back on them and gives them some glory.

There might be other logical or less logical reasons for the existence of R&D such as tax advantages or regulatory requirements or even others, which I have not listed here. Let me just mention the one reason, which I believe is the ultimate one, why any food company, small or large, locally, regionally, or globally active, traditional or more progressive has an R&D organization at the heart of their company. It is simple and one can probably best see this in the “SMEs” because it is so obvious there and not hidden behind sophistication and excessive and

abundant resources: without an idea, based on consumer-needs recognition and its technical elaboration to render it “manufacturable,” no food industry, and no other industry for that matter, would exist, thrive, and grow but would ultimately cease to exist.

1.5.2 Here we go: Justifications

Let me discuss the various reasons that I have listed in some more detail and find out, how much, if at all, these reasons contribute to the overall answer to the question: “why R&D” and how we can use these arguments to strengthen the position of R&D in your company internal discussions. And from personal experience I do know that you can use every argument you can get to not necessarily justify R&D in some of the tough meetings where this question comes up but to put you in a more comfortable and relaxed position, because no such justification is really needed.

My first answer was: “Because they can.” Yes, it is true that often things are done because one can. It is as simple as this and, surprisingly enough, is often a really strong driving force in the decision-making process. You may want to recognize that, based on my personal observations, the element of because we can always underlies any type of decision and subsequent consequences.

There are many examples of this approach in every industry’s R&D, although it is most often a function of “affluence” of the company. The smaller the company and the lower the budget that can be set aside for R&D, the more pragmatic the approach to this and other reasons such as need for innovation or consumer expectations prevail. With increasing size of a company, the overall budget for R&D in absolute numbers goes up and this attitude becomes stronger and stronger. I have seen many projects that were mainly done just because of this reason: we can, therefore we do. It sounds strange but reality is that this happens more often than one would think. And I have to say that it’s not always a negative thing because the success rate of R&D activities that were based on this approach is not really lower than for streamlined and focused ones. So, an R&D organization that exists and operates because the company, its management, and its decision makers justify its existence on because we can is not necessarily less efficient and successful than any other that exists for any of the other reasons that I have briefly mentioned and which I shall discuss in more detail.

1.5.3 Because we can is a great reason!

Let me give a few examples of successful R&D organizations—successful defined as successful consumer products developed by this organization—that largely existed and still exist on the premise “because we can.” Note that this is my personal judgment and you may not be in sync with me on this.

When Nespresso® was created as far back as the mid-1980s, it was mainly a small group of less than a handful of mostly technical experts, typical R&D people, who had an idea in which they strongly believed and which they had the strongest conviction to realize and bring to market. They had to operate almost in hiding; one could call this skunk work and management knew about it but did not want to hear about it. From an organizational standpoint,

Nespresso® survived these first years because of the attitude of because we can. If other reasons for the existence of R&D that I have briefly mentioned had come to play, such as good for the standing of the company or its management, great in the eyes of the financial analysts, or even good for tax write off, Nespresso® as a company might not have seen the success it ultimately could achieve.

This has of course also to do with patience. It is patience that a larger, more affluent organization can have because it is invested in so many, diverse, and already successful ventures. Smaller companies have a much tougher time in this “waiting for success,” and it is another example for my observation that the attitude of because we can is mostly found in larger and more affluent companies. Large companies have the means to wait for success, although not all large companies do this. This has a lot to do with the financial valuation of any company; it is like with credit ratings: the more open credits you have, the more late payments you have made, more litigations you may have had, and the lower your credit score. Same with corporations: the lower the number of apparent product launches and successes, the larger the number of projects, especially long-lasting ones, the more goodwill is invested into ventures and collaborations, the worse the note that financial analysts give to your company.

Let me come to the next reason that I have briefly mentioned: taxes or rather the optimization of these. Although financial support of an organization such as R&D is actually an investment into the present and especially the future, for tax reasons it is simply considered a cost to be deducted from profits, thereby bringing taxable revenue down a notch. R&D in the food industry is typically anywhere between 0.5 to approximately 2 percent, and such money can have an important impact on the balance sheet. I do not want to emphasize too much on some companies’ situations where rather complex tax constructs justify royalty payments and where it is not only good to have an R&D organization—because they can or because it reduces taxes—yet because other royalty payments would not be justifiable anymore. An example for an R&D organization that largely exists for these reasons is the large and global Nestlé organization. They are not alone in this, and other companies have a similar approach. I am not suggesting that tax considerations are the only reason why their R&D organizations exist, but they contribute to some pretty important degree.

1.5.4 New product development is everything, or is it not?

Another justification for the existence of R&D organizations is the straightforward, functional one: because it is necessary and it is at the heart of any new product development and innovation, especially in the first phase of any new product and process development. This justification is probably the most logical and best understood one; however, from personal experience, R&D organizations would not exist if that was the only reason for them to be. So, it is only one complementary part of the entire puzzle.

The consumer electronics industry and the automotive industry also have an important part in this because it is in industries like these that this justification for the existence of their R&D is, in my assumption, the strongest. Of course, every industry will boast that it is innovative and puts a lot of emphasis on new product development and wants to demonstrate their cutting edge side to their consumers. Food industry is no different from this type of approach,

however, it is often more of a lip service than a reality. I absolutely do not intend to suggest that innovation is not the driving force, yet it does not always take the important stand inside a company. Again, this functional reason of necessity for new product development and innovation is a complementary element and partial answer to the question of why an industry, why especially the food industry, needs R&D organizations.

The next reason on my list was the desire and need to satisfy financial analysts in their quest to evaluate and value companies. Financial analysts, like all economists, like to measure and use certain metrics to feed algorithms and come up with valuation numbers. There is nothing basically wrong with it, but one has to especially differentiate between types of industry. Large chemical companies, I mean the really large, global ones, may apply for more than 1000 patents per year; some automotive companies, the ones that are active in innovation, may have numbers in the hundreds of patents per year; while a large food company may apply for anything between 100 and 250 patents per year. Despite the fact that patents are only one element in the total IP portfolio of any company, their number is an easy metric to understand and use for valuation calculations. There are several other IP aspects such as manufacturing secrets, trade secrets, recipes, and marketing plans that all need to be taken into account when evaluating strength of a company's market position and its value. Patents are typically created by R&D and so are, to some degree, manufacturing plans. Hence, R&D has an important justification for existence when looking with the eyes of financial analysis and evaluation of any company.

1.5.5 Consumer is king

Another important reason for R&D to exist is to show consumers that the company is serious about its products, from all aspects (e.g., development of new, improvement of existing, better safety, healthier ingredients, better taste, less packaging, and ultimately better price-to-quality ratio). This aspect is not to be underestimated because, in my own experience, is maybe one of the most important justifications of all. After all, the consumer is king, or rather queen, and if a company would decide to neglect this truism it would quickly disappear from the marketplace. Most or all of these aspects are performed and realized by R&D, and therefore R&D has a nice sweet spot in any company. This sweet spot does, of course, not come for free, and expectations are typically higher than Mount Everest or Mauna Kea for that matter. But that's what comes with the sweet spot: the urgent need to deliver the innovative new products and processes as fast as possible.

Let me come to the final reason that I had mentioned at the beginning of this section: top management looks good if they can say that their R&D is great, top, world class, or whatever other attribute they might find for praise to the outside world or inside the company. The inside praise is rarer and always happens when R&D had come with something good and valuable for the company. I have seen many times how quickly top management's mood can turn depending on the internal reporting of successes or failures. First of all, the wind blows into the faces of individuals and entire sections; departments can be wiped out by the scorn of top management, which can hurt the well-functioning and organization of entire R&D groups. Luckily this does

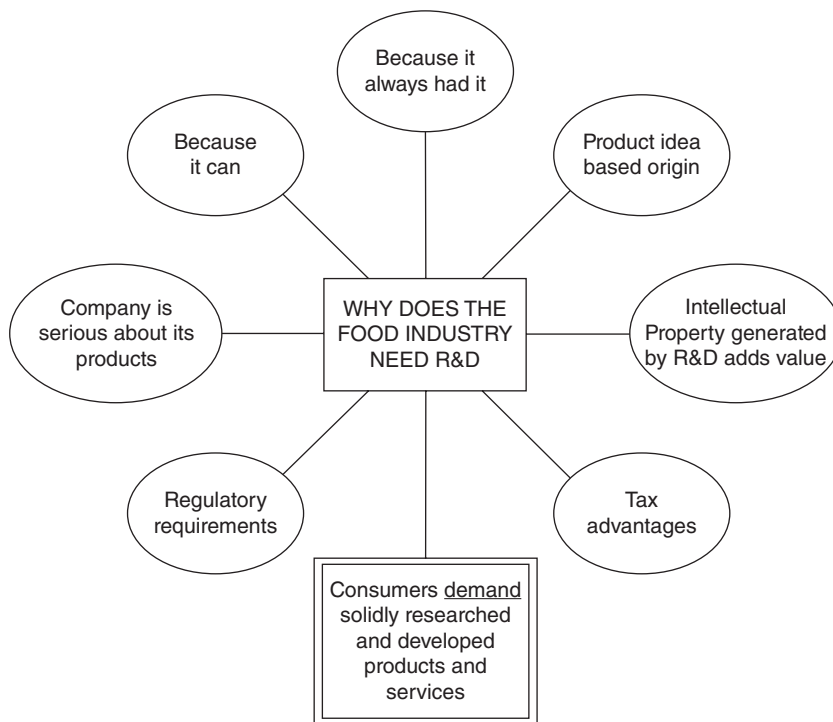


Figure 1.3 Reasons why R&D in the food industry exists.

not happen too often because R&D people are typically smart and they normally come up with successes or nothing. “Nothing” is nothing to report, therefore most or all of what is reported is successes. So, you see, no harm done. Or is there? Well, I shall discuss this in some more detail later in this book. However, I have seen top managers lose patience because of receiving “success reports” that were too easy to see through in terms of what the real quality of success was and subsequently putting research money somewhere else.

Figure 1.3 illustrates many or most of the reasons why there is an R&D organization in every food company.

1.5.6 It’s all about long-term thinking, stupid

To terminate this section of this first chapter, let me say one thing, which I believe answers the question of “why does the food industry need R&D?” best. In hindsight, and hindsight is known to be the only exact science, the great ideas and solutions for new and innovative product and process development always came from the R&D organization, small or large, food or other industries, local or global. And because we do not want to disturb this fine balance of creative minds and curiosity too much, we let R&D be R&D and come with the next great thing soon. There is, however, one unifying reason for R&D to exist in any type of

corporation, and which was not mentioned yet; it is the patience to wait out results combined with the culture of long-term thinking. I do not want to embark on a definition of what is long-term at this point because it is most certainly defined differently by different players in the industry. In conclusion, this is not to say that today's R&D organizations should also be tomorrow's, and that is exactly the topic that I shall discuss, analyze, and synthesize throughout this entire book.

1.6 SUMMARY AND MAJOR LEARNING

- In the introduction I suggested to play a little game: find different meanings for the acronym R&D. I suggested that the ultimate meaning of R&D is not “Research & Development” but “researched & developed” (i.e., executed and successfully done)!
- R&D: headache versus solution. R&D's role is not always clear and easy to understand and always requires justification, or so it seems.
- Scientists and engineers versus business or rather with business: there is not always a clear answer; collaboration and respect are key.
- Looking back to the early years of corporate R&D in the industry: much paper was created, hope prevailed.
- The book focuses on the three major drivers for R&D in any industry: Hope, Never-Give-Up, Success.
- The early days of the food industry R&D: focus on resources and feared scarcity defined research programs.
- Large and monolithic projects dominated the playfield (e.g., single-cell proteins, coffee technologies).
- During the evolutionary years of food industry R&D we came from few and large projects to many and small projects.
- This led to a strong dilution of expert resources over many not so significant projects, however helping to minimize risk of failure by this large spread of activities.
- It was suggested that modern food and nutritional science started with the discovery of the role of essential fatty acids in the late 1920s.
- Project themes during the evolutionary food R&D period evolved around ingredients and processes, first macronutrients such as lipids, proteins, and carbohydrates followed by all other minor ingredients such as vitamins, minerals, colorants, texture-building agents, surface-active ingredients, all coupled with progress in food processing technologies.
- The existential question “why does the food industry need R&D?” was asked and discussed in some detail.
- Major reasons are: because they can, tax optimization, functional reasons (new product development), financial considerations (to please the analysts), improved standing with consumers, and top management looks good.
- The unifying reason, however, is the willingness of good companies to wait for success and long-term thinking.

REFERENCES

- Bamberg, JH, 2000, *British Petroleum and global oil, 1950–1975: The challenge of nationalism. Vol 3 of British Petroleum and Global Oil 1950–1975: The challenge of nationalism*, JH Bamberg British Petroleum Series, Cambridge University Press, Cambridge, United Kingdom.
- Burr, G, Burr M 1929, A new deficiency disease produced by the rigid exclusion of fat from the diet, *J. Biol. Chem.*, vol. 82, pp. 345–367.
- Burr, G, Burr M 1930. On the nature and role of the fatty acids essential in nutrition, *J. Biol. Chem.*, vol. 86, pp. 587–621
- Meadows, DH, Meadows, DL, Randers, J, & Behrens, WW (1972), *The limits to growth*, Universe Books, New York.
- Sprecher, H, 1981, Biochemistry of essential fatty acids, in *Prog. Lipid Res.*, vol. 20, pp. 13–22.
- Traitler, H 2015, *Food industry innovation school: How to drive innovation through complex organizations*, Wiley-Blackwell, Hoboken, NJ.
- Traitler, H 1987, Recent advances in capillary gas chromatography applied to lipid analysis, *Prog. Lipid Res.*, vol. 26 no. 4, pp. 257–280.